THE IRON TRADE REVIEW

VOLUME XXVII. CLEVELAND, O. APRIL 26, 1894. CHICAGO, ILL. NUMBER 17.

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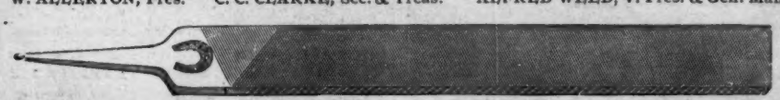

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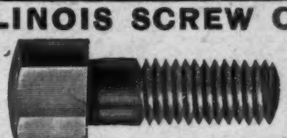

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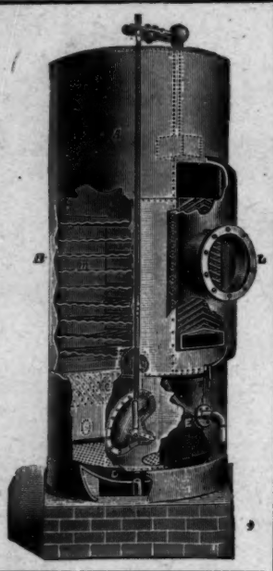

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THE IRON TRADE REVIEW

VOLUME XXVII. CLEVELAND, O. APRIL 26, 1894. CHICAGO, ILL. NUMBER 17.

THE WEEK IN IRON CIRCLES.

GENERAL FEATURES.

Attention has been concentrated, in the iron trade the past week, on the coal miners' strike and the advances that have come in some departments of the market, partly in consequence of fuel scarcity and partly because of continuing heavy demand. Wednesday afternoon's advices from the Connellsville region stated that the strike started there Tuesday was rapidly spreading, with indications that operations would be stopped throughout the region, It is known that the blast furnaces dependent upon Connellsville coke, with a single exception, have no accumulated stock of fuel, and if the strike continues it can be only a matter of a few days when all will be out of blast. The duration of the strike is entirely a matter of conjecture. Thus far there is no move for the conferences which the miners insist upon. The men having demonstrated the completeness of their organization by bringing out 135,000 workers, with daily additions to this number, are very deliberate in their movements. In the South the effect will soon be to put Alabama and Tennessee furnaces out of the producing column, but advices of Wednesday to this paper indicated that no curtailment of pig iron production had yet come. One Sloss furnace was expected to stop in a few days, and the operation of others for any length of time was contingent upon developments in the miners' strike. In pig iron the feature of the situation is continued firmness in Bessemer. The large transactions of ten days ago were succeeded by a brief lull, but in the past few days inquiries have been numerous, and Valley furnaces that have sold at $9.75 have had offers at $10. At Pittsburg, $10.75 is the quotation of some sellers and transactions are reported at $10.60. While of course a cutting off of the coke supply will affect steel works as well, so that the conversion of Bessemer iron would be shortened, such works as use natural gas entirely and Eastern works using anthracite would still be able to run. The Eastern demand for Bessemer from Pittsburg and Valley furnaces continues and has been a factor in causing the advance. Steel billets are also firmer and mills have advanced prices about 25 cents a ton, $15.75 and $15.90 being current at Pittsburg, though no sales are reported yet at the latter figure. In foundry and mill iron there is still no trace of improvement. In the East there has been further buying by pipe founders on the same low basis. Finished material shows a stronger market outside of bar iron and steel. An Eastern wrought pipe concern has booked an order for 10,000 tons of pipe, Western delivery, and the skelp departments of three Eastern mills will be busy for some time in consequence. A large order for structural steel for the Northwest has been taken by an Eastern Pennsylvania mill. Pittsburg mills have been adding to their order books and on some descriptions of plates prices have advanced $2 to $3 a ton over the lowest point touched.

THE CLEVELAND OUTLOOK.

Several ore sales in 10,000 ton and 15,000-ton lots have been made in the past week, in most instances the ores being those of which large sales were made some weeks ago, and the prices the same as those of the early transactions. There is no disposition by selling firms to push for business on the low basis established for 1894, and while nothing in the course of the ore trade thus far in the year gives the faintest suggestion of improvement, a disposition exists to look for better things as the result of the forward movement in Bessemer pig. Some authorities argue that present conditions are more favorable to the maintenance of this advance than were those preceding the February spurt. An element of uncertainty in the ore situation is the agitation at some of the mines for higher wages. In Gogebic county, Michigan, the success of a people's ticket at the recent election and the decision to issue bonds to carry on public work have brought discontent with mining wages and a strike on May 1 is mooted. Such a step would only result in defeat for the men and if a prolonged shut-down came, would simply throw to steam-shovel mines the demand which is now giving employment to "natural labor."

Pig Iron. An advance of 25 cents a ton in Bessemer iron is the important development of the week. While valley transactions have for some time been on a $9.75 basis for large lots, $10 has been secured in the past week, and the numerous inquiries for this metal would indicate that the advance will be maintained. The coal strike, while it will also somewhat reduce Western demand from the steel works, has not interfered with the Eastern trade and a considerable shipment of Bessemer to the East is still going on. The H. C. Frick Co. notified its blast furnace customers on Tuesday that it would be impossible to ship the usual supply of coke. This was followed by an announcement that none could be shipped and furnaces have been banking or preparing to bank since that date. In the Pittsburg district the Monongahela, Edith, Shoenberger, Laughlins', Lucy and Isabella furnaces have already suspended and by the close of the week it is thought valley furnaces will all be banked. The three active furnaces in Cleveland have already had orders to stop. Some Valley producers are refusing $10 at furnace and the largest consumers are in the market.

Finished Material. The firmer feeling noticed last week as to structural material continues, and transactions in beams and channels, angles and plates are made at $1 and $2 a ton advance. Buyers seem to have expected the turn and are not contesting it. The week's demand has not been heavy but the mills are generally well employed. Bar iron and steel are about stationary; the best that can be said is that there is no further weakening. Near-by iron mills are running just as orders require.

THE CHICAGO OUTLOOK.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Another quiet week has passed, with small sales and few of them to its credit. In crude material only a few orders have been taken, and finished material is in little, if any, better shape. A peculiar feature of the situation in billets and rods is that while the local mills are shipping all the material they can make, and are continually receiving inquiries for quotations on shipments to be made in May and June—all of which they are obliged to refuse, being full to July 1—none of the buyers seem to think there is any chance of an increase in price the first of July, or before. Yet it seems probable that billets will be in great demand for shipment after July 1, although up to the present time no inquiries for such shipment have been received. In rails there continues to be a good and growing inquiry for street railway requirements, and there is every probability that this branch of the trade will show a good tonnage closed in the near future.

PIG IRON.—One or two orders as large as 500 tons of local coke have been secured, but the bulk of the business is car load trade, and not very much of that. In Southern iron business has been quiet, and except for a couple of orders, one of 300 and one of 500 tons, little has been secured. Open quotations have been lowered 25 cents a ton, as shown elsewhere. Rumors have been current lately to the effect that some of the Southern railroads were weak as to rates, but diligent inquiry failed to elicit any definite information. In Lake Superior charcoal only a small carload business has been done.

BARS.—Very little business has been closed, and that only for small lots. Quotations are continued at 1.10c. to 1.15c. for both iron and steel, Chicago.

STRUCTURAL MATERIAL.—The 500-ton order spoken of last week has not yet been placed, but will probably be decided some time this week. A fair business has been done in small orders. Prices are unchanged: Beams and channels, 1.35c to 1.40c; angles, 1.30c to 1.35c; plates, 1.35c to 1.40c; tees, 1.50c to 1.60c.

RAILS AND TRACK SUPPLIES.—There appears to be a good outlook for the immediate future in the rail trade. The local mills have their output contracted ahead for the next four months, and besides the demand for street rails, noted at the head of this report, several deals are being figured on for standard sections that will probably be closed shortly. Prices are as last reported: Rails, $25 to $27; splice bars, 1.40c; track bolts, 2.30c to 2.40c; spikes, 1.75c to 1.80c.

BILLETS AND RODS.—The situation remains unchanged. An order for 4,000 tons of billets for May and June delivery was refused by the local mill last week, as they are sold up to July 1. In rods business is quiet. Prices are maintained at $17.25 for billets and $26.50 for rods.

PLATES.—The trade in the past week has been quiet, with only a few small sales. Prices are as last reported: Tank steel, 1.35c to 1.40c; flange steel, 1.65c to 1.75c; fire box steel, 3.75c to 4c; boiler tubes, 75 per cent. discount.

MERCHANT STEEL.—The trade has been quiet in the past week, only a few orders of any consequence having been secured. Prices are made as follows: Open-hearth spring, machinery and tire steel, 1.85c to 1.90c; crucible spring, 3.50c; machinery, 4.50c to 4.75c; tool steel, 6½c and upwards.

SHEETS.—Black sheets have had a larger sale in the past week, with quotations at 2.30c to 2 40c for No. 27 common. Galvanized iron, while having a little better demand, is still quiet. Quotations have been lowered considerably, being made at 80 per cent. discount, and rumors of still lower figures are heard.

GENERAL MARKET RESUME.

SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg. The decision of a large body of coke workers to join the general miners' strike means a considerable curtailment of blast furnace operations. The future depends on the duration of the trouble and predictions are of no value. It can readily be seen that in view of the firming of Bessemer pig, due to the heavy sales in April, and the better price billet makers have been getting for their product of late, curtailment of production can only give additional strength to both markets. There have been many consumers in the market for Bessemer the past week and $10.40 @ $10.50 are reported in connection with two transactions of 5,000 tons each, with Pittsburg furnaces. No. 2 foundry at $10.25 @ $10.50 and gray forge at $9.25 @ $9.50 are current quotations, with no change in the situation as to either. Connellsville coke production has been greater the past week than in either of the weeks preceding, 10,600 ovens being reported active on Monday, but tools were thrown down at a number of works on Tuesday. Billets and slabs are now quoted at $15.50 @ $15.75 at mill, showing more firmness by producers. Transactions have been few. At Wheeling there has been a better demand and the quotation has been advanced by some sellers there to $16. The finished material market is unchanged, though the better feeling in structural material continues.

Louisville. There continues to be a fair amount of selling but prices have not improved. In the case of the largest sale, between 2,000 and 3,000 tons, prices were made for long deliveries as low as $6.75 Birmingham for No. 2 Foundry, and other grades in proportion. Buyers appreciate the extreme low offerings, in that they are trying to purchase for Fall delivery upon this basis; whether furnaces will decide that it is wise to sell so far ahead has not yet been determined. Among pipe shops a large number of orders for finished product are being placed, but no change in prices, sales being effected on a basis in which every concession is made in favor of the buyer, leaving no profit to the producer. Car companies report scarcely any work in sight, even at present prices.

Detroit. "The record of last week," writes F. B. Stevens, "shows no remarkable change in sales or prices of pig iron. One lot of 200 tons of Lake Superior charcoal was sold, and the furnaces report some increase in way of inquiries. The impression is general that stocks in hands of consumers are pretty well reduced and a gradual increase of sales is therefore hoped for. A large consumer of Southern coke iron here apparently believed that the price of this product had no bottom. This idea was also entertained by an ambitious seller who accepted their order for a large tonnage 'subject to approval of the furnace.' But 'even the worm will turn,' and that is what the furnace in question did. It declined with thanks, and the sale was declared 'off.'"

Cincinnati. Pig iron trading has run light in all directions partly because of general lack of interest in the market and partly because Alabama furnace companies have practically withdrawn from the market on account of the strike of 9,000 miners. The latter trouble, if it continues for any length of time, must inevitably curtail sharply the production of Alabama iron. Foundries doing engine and machine work report an enlarged inquiry, particularly in lines connected with electrical construction, street railroads, city improvements, etc.

THE IRON TRADE REVIEW

DEVOTED TO
IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES, IRON ORE PRODUCTION, TRANSPORTATION, AND GENERAL INDUSTRIAL PROGRESS.

PUBLISHED EVERY THURSDAY BY

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ENTERED AT THE POST OFFICE IN CLEVELAND, O., AS SECOND CLASS MATTER.

APRIL 26, 1894.

CHAIRMAN VOORHEES, of the Senate Finance Committee, says in a letter to a constituent that he fought hard against any duty being put on sugar, iron or coal, and only consented to the duties finally agreed upon in committee "when it was demonstrated in a full three-days' hard working caucus of all the Democratic Senators as well as in the committee, that a bill with these articles absolutely on the free list could no more pass the Senate than a ship of lead could navigate the ocean." The present outlook is that the Senator's ship of lead will stand quite as good a show of sailing as will the tariff bill of passing, with its income tax attachment. It is the apparently unalterable opposition of certain Democratic Senators to the bill in its present shape that prevents the majority in the Senate from pushing it to an issue. Unable to pass the bill in its present form, and unable to agree on changes that will make its passage sure, the disposition seems to be simply to wait for something to happen, without the remotest idea what that something is. Meantime there are suggestions of a new bill—a compromise—and the *Bulletin* of the American Iron and Steel Association finds hints of it in the speeches of Senators Hill, Quay and Smith. The Wilson bill is a compromise, for that matter, and the bill as it stands in the Senate has added fresh compromises. What the *Bulletin* wants is a compromise that, while reducing duties that are higher than necessary for the protection of capital and labor, secures reasonable protection, "but solely with the view of securing relief for our distressed industries and bringing back to the country its old prosperity." The fact is, there has been an immense amount of juggling with terms in the discussion of tariff legislation. Tariff-for-revenue-only advocates have had an unreasonable antipathy to a name. There is no escape from protection, call your tariff by what names you will. Any article produced in this country, on which a duty is laid for the purpose of getting money to run the Government is a protected article and the manufacturer of it is a protected manufacturer. There has always been protection on some things and in some degree. The contention of consistent protectionists is that this inevitable protection shall go all around, instead of being put here and there, and that it shall be adequate to the maintenance of home manufactures as they exist, instead of being laid with a view to raising large revenues and reducing home production to the output of plants farthest remote from the seaboard, which secure protection by the accident of geography and the costliness of transportation. We do not look for the majority at Washington to agree to a tariff bill framed on any out-and-out recognition of the protection principle, even though that principle has already been recognized in effect, in certain sections of the pending bill. It seems more probable that they will prefer to go to the country with a record of having tried and failed, to wipe out the McKinley bill.

FOUNDRYMEN have been learning the use of No. 2 iron the past year, and many have come to the point of almost altogether doing without the No. 1 foundry iron which formerly was a large part of their purchases.

ONE establishment that is included in the new steel casting consolidation will save $8,400 in salaries of officers and salesmen by the new arrangement. And the officers and salesmen displaced at this and other establishments, by the amalgamation of positions, what method shall they adopt of putting an end to the "ruinous competition" which they will now encounter in the effort to market their talent and experience?

THE March exports of British iron and steel to the United States are shown in the following table, which gives also the figures—all in gross tons—for March of the two years preceding:

	1894	1893	1892
Pig iron	889	4,268	4,645
Bar, angle, rod and bolt iron	71	396	187
Railroad iron and steel	—	184	—
Tin plates	16,907	31,334	23,789
Iron and steel wire	341	391	147
Hoops, sheets, boiler plates	947	3,245	362
Cast and wrought iron	182	483	263
Steel, unwrought	1,180	2,984	1,734
Iron and steel combined	49	82	121
Old iron	526	938	1,230
Total	21,092	44,305	32,498

The total thus appears to be less than half that of March last year and about two-thirds of that for the same month in 1892. Tin plates, pig iron, unwrought steel and the item of hoops, sheets and boiler plates all show a heavy falling off—these being our chief articles of import from Great Britain, in iron and steel. There was an increase over the February total, the latter being 16,422 gross tons. The total of iron and steel exports from Great Britain in March was 196,309 tons, valued at £1,453,506. In March last year it was 220,837 tons, valued at £1,873,592; in March, 1892, 218,980 tons, valued at £1,860,382. The falling off in value from last year was about $2,000,000.

A CORRESPONDENT sends us a newspaper clipping, credited to *American Industries*—evidently a spurious name behind which the paper printing the article hides. It is as marvelous a compost of rhetoric as of untruth. We are told among other things that "facts are accumulating with damning iteration" going to establish a "conspiracy of idleness" on the part of manufacturers; that "exasperated beyond measure and goaded by a licentious and evil-disposed press, manufacturers all along the line shut down their works and waited for the rigors of winter and the cries of want to emphasize their 'I-told-you-so hypocrisy.'" The article is lurid in other ways. We should not have been surprised to see it credited to the *American Anarchist*, were such a publication in existence. One of the "facts" on which this outburst is based is the

resumption of the Illinois Steel Co., "with orders enough on hand to keep the mills running night and day for two years without intermission, if not another single order should come in." And to add to the "damning iteration" of it all, we are told that this company "uses in its manufacture 9,000,000 tons of iron ore in a year," the writer evidently seeing the necessity of preserving a proper perspective to the ridiculous order book story. It is surprising the currency such lunacy has received in papers that should know better; and yet one is prepared for anything after reading some of the Congressional frothings about a manufacturers' conspiracy and the bulldozing of workingmen into protesting against a bill to keep them in idleness.

THE increase in the Canadian tariff on old material from $2 to $4 a ton will no doubt tend to curtail the trade of the United States with that country in scrap and old rails, which has been growing rapidly the past year. At the unprecedented prices for old material that have prevailed of late, it is not surprising that 4,000 tons of old steel rails at $9.25, New York, and 1,000 tons of old iron rails at $11.25 were purchased recently for shipment to Europe.

THE Boston *Commercial Bulletin* notes the growing sharpness of the struggle between iron and steel in New England and the added hardship to New England mills of the low freights from Pennsylvania points:

It cannot be denied that American soft steel is making deep inroads into the bar iron market. The introduction of soft steel is encountering stronger opposition than the substitution of steel in heavy work, like structural shapes and plates, because its success means the ruin of many small bar iron mills situated all over the country. The soft steel makers have the great advantage of being able to manufacture by a cheaper process than the bar iron makers, and besides, strange as it may seem, the former have cheaper freight rates from eastern Pennsylvania to most New England points than New England mills. The local bar iron mills are making a noble struggle to retain their markets and are meeting every reduction made by the soft steel people, which means bar iron in large lots as low as 1.12 or 1.15 cents per pound. A year ago this same bar iron was bringing 1.50 cents from the mills.

MR. CHAUNCEY DEPEW, on his return to New York last week from an inspection tour over the Vanderbilt lines talked freely to an interviewer on various phases of the industrial situation as he encountered them. Of the possibilities of early railroad demand for purposes of repair and maintenance he did not speak encouragingly and for cause he points to the World's Fair:

"The preparations for the World's Fair traffic of last year gave all the Western lines a surplus of equipment, which they never would have had otherwise. The physical conditions of the properties were also improved in anticipation of the heavy traffic for the Fair, and, indeed, all the roads West are getting the benefit of it in these trying and dull times. It enables them safely to suspend a large amount of what would otherwise be necessary repair and maintenance work."

The development of the natural gas belt of Indiana was an especially interesting study to the party. On this subject Mr. Depew says:

"The growth of towns was more rapid there than in any booming Western State, until the panic suspended everything at the beginning of last year. The supply of gas seems to be inexhaustible, and covers such a large extent of territory that if legislative conditions were favorable in the country, there would be an immediate and healthy growth in that section. The gas can be had anywhere for the boring; the expense of handling and using it is comparatively so much less than that of coal that it would attract from other places manufactories of all kinds, and would enable them to conduct their business upon a basis of cost which would make this region a most dangerous competitor with Pittsburg, Birmingham, Chicago and Cleveland. We stopped at one station, which had grown from 300 to 5,000 in population within three years. Its people had no money and no occupation for months until within a few weeks before we came. There is a glass factory there which had been closed for a while, and then opened with 40 furnaces, the total capacity being 300 furnaces. The proprietor said that after Senator Hill's tariff speech he opened 100 more furnaces, being so convinced that the New York Senator's speech meant the practical death of the Wilson bill that he felt justified in employing more men and piling up a considerable stock of merchandise."

It is an evidence of the exceptional resources of the gas belt that it is taking the initiative in new factory building, after the long suspension forced by the panic. Three new tin plate companies are erecting plants; a new rolling mill is going up; plans are practically consummated for the enlargement of another mill; an extensive malleable iron plant, under construction, is about to begin operations, and several minor industries are being located and will start up before the end of the year.

MATTHEW MARSHALL said in the New York *Sun* of Monday that numerous as are the signs of returning activity in business, in various parts of the country, the sluggishness of industry is evidenced by the continued accumulation at New York of an idle circulating medium, which ought to be finding employment elsewhere. And he might have added that this sluggishness of industry is also evidenced in the continued demonstrations by idle labor that ought to be finding employment somewhere. The surplus labor that is going up and down the country, or gathering daily by thousands in the cities, presents a problem for serious thinking. Whatever will loosen the money gorge at New York will in large part solve this problem of labor without opportunity to earn its wage. Employed money and employed labor are simply cause and effect. And those who have thought to compel capital to go without adequate return reckoned without the corollary to that proposition, which is inevitably and always, labor without the chance to get its price. We wonder if the lesson has really been learned, where it needs to be learned, that a blow aimed at employing capital always smites labor with equal force.

AN explosion a few days ago at Furnace D, of the Edgar Thomson plant, did much damage and the escape of employes was a narrow one. The day may come when it will be found profitable to apply the briquette idea to fine ores, after screening out the lumpy ore as it dumps from the cars. What has been accomplished with coal, by the manufacture of lumps out of dust and slack, suggests an apparently reasonable solution of the troubles arising from the packing of powdery ores in the furnace.

WHILE in Washington recently, to urge his fellow-partisans of the majority to vote for the 40-cent duty on iron ore, Hon. Peter White, of Marquette, talked for print about the project that has long been the dream of upper peninsula capitalists, to bring coke to the ore and make pig iron at the mines. He thought no time so opportune as the present, with its low rates of lake freight, and added that West Virginia coke had been offered at exceedingly low prices. The plan would utilize low grade ores which it has been unprofitable to ship. Mr. White intimated that a move would be made in the matter this season and suggested that a furnace would be located

near the lake shore, perhaps at Marquette. We fancy that the carrying out of this scheme is not so imminent in Mr. White's mind, as the newspaper accounts would indicate. Ores of high iron content can be so cheaply carried to the furnaces of the valleys and Pittsburg this year, and the pig iron made from them is so exceedingly cheap, as to make this the most inopportune of all times for bothering about lean ores. The proposition is open to the same objection as Edison's scheme to concentrate the magnetic ores of the upper lake region—the best is too cheap for making any money on the inferior.

If, as coke producers assure us—and the evidences are in support of the claim—there is no money in coke at present prices, and the question is simply one of the size of the loss, the time is ripe for more serious consideration of propositions for the saving of by-products. It has been claimed by Connellsville producers that under present conditions, and without an entire revolution in methods and in the ideas of coke consumers, there could not be any such development of the by-product industry as is seen abroad, and maintain the favor in which Connellsville coke is everywhere held. In other words the coke would be robbed for the sake of the by-products. But if profitable tar and ammonia and benzole production are possible, even at the expense of the tribute which prejudice might exact on the price of the coke, is not the experiment worth a trial? And is any time more fit for an innovation than a period of profitless business on the old basis? It generally requires some unusual disturbance of conditions to furnish justification for radical departures.

The Coal Strike and the Coke Situation.

Dispatches of Wednesday, April 25, from the Connellsville region stated that the coal strike begun in that section on Tuesday was rapidly spreading, with indications that all the coke works would be shut down within a day or two. Blast furnaces in Cleveland, the Valleys and Pittsburg had word from coke producers that shipments would probably cease altogether in a few days and furnacemen at once prepared to bank their stacks. There are predictions that the miners' strike will be settled or in a fair way of settlement by May 1 and the report that the miners in the Pocahontas district of Virginia refused to go out will doubtless hasten action by the strike leaders.

The production of coke in the Connellsville region in the week ending April 14 was 21,000 tons more than in the preceding week. There were 9,652 active ovens, against 9,013 in the week preceding and 10,866 in the week before the former strike. The output in the first two weeks of April was 71,987 tons and 93,276 tons respectively; in the last two weeks of March it was 113,921 tons and 107,101 tons. Shipments in the second week of April were 4,691 cars, a gain of 250 cars over the week of the outbreaks. No change in the price of coke has taken place.

A New Boltless Rail Joint.

The Permanent-Rail-Joint Co., incorporated at Columbus last week is composed of Cleveland gentlemen who have organized to manufacture the rail joint patented by J. L. Pope. The directors are: J. L. Pope, president; E. A. Angell, vice president; E. C. Pope, secretary and treasurer; C. H. Cady and J. K. Bole. The feature of the Pope rail joint is a construction that produces automatic tightening, so that instead of loosening from pressure and jarring, the tendency is for it to tighten. This is secured by a series of wedges. Beside the fish plates there is a plate under the rail. Two wedges on each side make seven pieces in all. The ordinary joint with fish plates and bolts consists of 14 pieces and where washers are used this number is increased to 20. It is claimed that after the boltless joint of the new company is once firmly set there can be no motion and consequently no wear. These joints are already in use. They are of steel and for the present will be manufactured in Pittsburg and Cleveland.

AMONG THE IRON MINES.

The machinery and material at the Dunn mine, belonging to the York Iron Co., were bid in at sheriff's sale last week by Price McKinney, representing Corrigan, McKinney & Co., of Cleveland. His bid covered all the wage claims against the company. Corrigan, McKinney & Co. are prepared to reopen the mine immediately in case a satisfactory royalty can be obtained from the owners of the fee. They have offered 15 cents a ton; some of the fee holders who do not seem to know that times have changed insist on 40 cents.

There are newspaper reports that some of the 1,300 men at the Norrie have been agitating a strike, and that May 1 has been talked of as the time to demand an advance. The Norrie has a large stockpile and shipments could be made for a good share of its sales. It cannot pay more for labor, on the $2.75 basis for ore, and its contracts make special exemptions in case of strikes. On the present wage basis it is possible for miners to average $1.50 a day.

Before the closing down of the Volunteer mine two weeks ago, Gen. Alger, its president, proposed that the mine be turned over to the men, giving them a chance to work it and make out of it what they could. He was willing to bear some of the expense incident to operation in order to give the men employment. The offer could not be accepted, as the men could not work for nothing pending a sale of the ore, nor could they find anybody willing to carry their stockpile.

The Mahoning Valley Iron Co., C. D. Arms, the Andrews Bros. Co., of Youngstown, and the Monongahela Furnace Co., of McKeesport, Pa., are interested in the Mahoning Valley Iron Co., which has increased its capital from $40,000 to $100,000 to develop leased lands on the Mesabi.

Duluth and Mesabi range papers are calling for a reduction of rail rates from that range and for pronounced concessions on royalties. Such reductions on old-range properties are cited and it is argued, with not a little display of bitterness, that the independent operator on the new range is entitled to concessions that will put him in position to compete. Says the *Mesabi Range:* "If the railroads continue the present arbitrary rates and the syndicates sell ore at a price that does not allow anything for royalty, it will not be long until practically all the holdings on the range will be in their grasp and at their own price."

The Canton is raising about 1,000 tons a day. At the Franklin 400 to 500 tons a day is being raised and put on stockpile. At the Mountain Iron a limited force is employed and both stripping and taking out ore are in progress.

According to returns collected by the German Iron & Steel Association, the total production of pig iron in the German Empire last year was 4,986,003 tons, a total exceeding the production of any previous year, and 48,542 tons in excess of the production in 1892. The imports of foreign pig are returned as 361,288 tons as against 349,820 tons in 1892, and the total exports of pig iron at 1,688,221 tons as against 1,574,486 tons in 1892. These figures show that the quantity retained for home consumption was 3,659,070 tons, or somewhat less than in 1892, for which year the figures were 3,712,795 tons.

Thomas Sharp & Co., whose machine shop and foundry at Salem, O., burned April 22, say that they will rebuild at once. Among the property destroyed was several thousand dollars worth of patterns, some of which had just been sent to these works by the Buckeye Engine Co., of Salem.

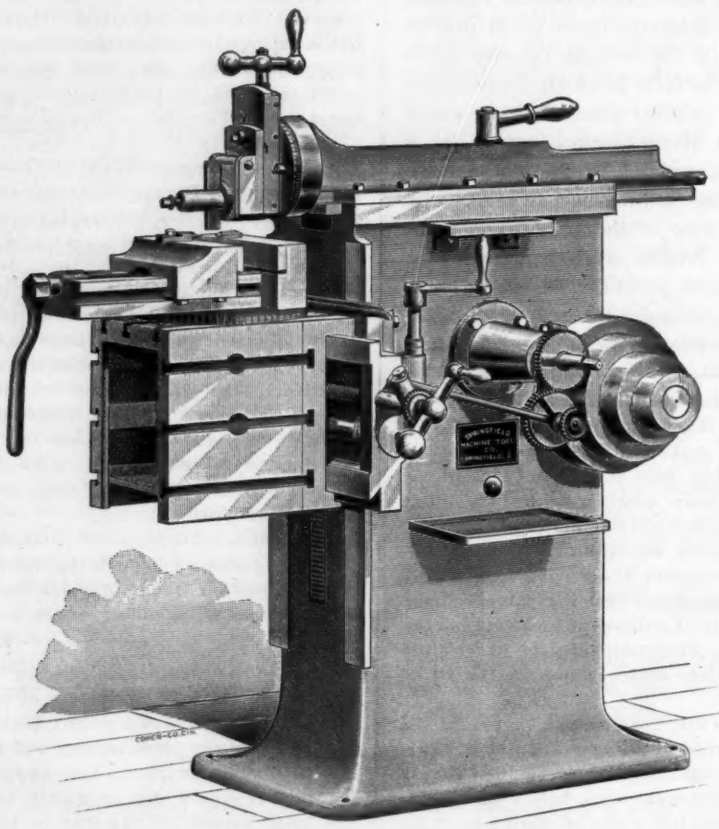
The quarterly report of the United States Iron & Tin Plate Mfg. Co. to the Special Agent of the Treasury Department, shows that during the quarter ending March 31, 1894, there were produced at the United States Iron & Tin Plate Works at Demmler Station, Pa., 2,020,757 lbs. of tinned plates and 1,186,360 lbs. of black plates for tinning, or a total of 3,207,117 lbs. Of this 2,867,648 lbs. were lighter than 63 lbs. and 339,469 lbs. over 63 lbs. per 100 square feet.

The Cleveland Rolling Mill Co.'s works are operating in all departments except the plate mill, and about 4,000 men are given employment.

A NEW CRANK SHAPER.

The illustration shown herewith represents a new 15 and 20-inch crank shaper, sold by Messrs. Dawson & Goodwin, 57 S. Canal st., Chicago. The special claims made for it are convenience, simplicity and strength. The stroke of these shapers can be changed and adjusted while running. Being operated by a crank motion, it is at all times positive, and the shaper will invariably plane to a line, making it a desirable tool for die makers and in all positions in which accurate work is required. The vise is swiveled, and may be transferred from the top of the table to the side, adapting the machine to a larger range of work. Centers are furnished suitable for planing grooves in taps, reamers or any light cylindrical work. With each machine is furnished an improved box table. Work can be bolted upon the top and both sides.

Being made in this form it has, in addition to the above advantages, a degree of stiffness not obtainable in one-sided tables. It can also be utilized as a receptacle for tools, etc. The table may be removed and the work bolted to the slotted apron to which the box table is attached. This is desirable in planing the tops and sides of heavy pieces, such as legs of machines, etc. The machines are heavily geared, giving great power with high belt velocity. The gears are well proportioned, and are cut from the solid. All the bearings are accurately scraped to a fit; all studs and screws are made of steel.



A NEW CRANK SHAPER.

For further information, write to or call upon Messrs. Dawson & Goodwin, at the address given above, where these and a full line of first-class metal working tools are at all times kept in stock.

SHOP AND FOUNDRY NOTES.

The thirty-sixth meeting of the Foundrymen's Association will be held at the Manufacturers' Club, Philadelphia, Wednesday evening, May 2. Mr. Thomas D. West will make an address on "The Erratic Square Test Bar: a Study in the Physical Analysis of Cast Iron." This paper will call in question all records of cast iron procured by means of a square test bar and will also be a criticism on Keep's system of physical tests. A paper on "The Strength and Resilience of Structural Cast Iron" by Prof. J. B. Johnson, of Washington University, St. Louis, Mo., will be presented. This is a treatise on cast iron vs. castings in steel for structural work and favors cast iron. A further discussion on W. J. Keep's last paper, which appeared in *The Iron Trade Review* of the 12th inst., in which also will be found the proceedings of the last meeting, is on the programme. The question box is a new feature in the association and those who have questions they want answered are asked to send them to Secretary Evans. They will be presented without name if desired.

It is probable that in very few instances are lathes and other machinery run to their economical limit with regard to the amount of work they can perform, and this is many times due to the feed which the makers put on them. A comparatively slow speed of cutting (slow running of lathe) and a heavy cut with a moderately quick feed, it is believed will give good results in most cases. Although on work where the material is so light it will not stand a heavy cut the other plan must be worked, of running higher speed and reducing depth of cut. This is a question worth thinking over and economical shop running demands that attention be paid to it, each kind of work being tried separately for best results.

Martin L. Fox, president of the Iron Molders' Union of North America, stated at Milwaukee last week that the foundry business had not been in a satisfactory condition in the Northwest for the past 10 months. He had found foundry work more plenty in the East than in the West. Molders' wages in the West had been reduced 10 per cent. and in some places another reduction was threatened.

The suit against the city of Cleveland by the Lake Shore Foundry Co. has ended in an order restraining the city from contracting with J. B. Clow & Son for World's Fair pipe, on the ground that the city advertised for new pipe. New bids are to be asked and the specifications will be made so that J. B. Clow & Son may offer the pipe in question. At a recent competition in Toledo, O., the Lake Shore Foundry Co., bid $17.15 on pipe delivered in Toledo. Their bid to the city of Cleveland was $21.45.

At the 23d annual meeting of the National Association of Stove Manufacturers beginning May 2, at the Auditorium Hotel, Chicago, several papers on subjects of interest to the general foundry trade will be read. These include "Foundry Management," "Cleaning Castings," "Pattern Construction, Including Follow-Boarding," and "Principles of Design as Applied to the Ornamentation of Cast Iron."

THURMAN FUEL OIL BURNER CO.'S SYSTEM.

Illustrations on other pages of this issue direct attention to the process of the Thurman Fuel Oil Burner Co., of Indianapolis, Ind., the invention of John S. Thurman, M. E. Their system is adapted to boilers, reverberatory furnaces of all kinds, to puddling furnaces, forges, dry kilns, etc. The desirable points about the use of crude oil as a fuel have frequently been set forth. Fuel economy, reliability, the fact that no expert is required, the lower cost than that of coal, absence of soot, sparks, smoke and odor—are the chief claims made for the Thurman system. The burners generate pure hydrocarbon gas and every unit of heat the oil contains is utilized and applied without any expensive intermediate process of treatment.

The storage tank is placed underground outside the building. An oil pump in the building forces the oil from the tank into an interior standpipe. From the latter it goes by gravity pressure to the burners where it is atomized by a supply of steam. The standpipe has an overflow pipe back into the tank which prevents overflow and preserves a regular oil pressure. The proportions of oil and steam are regulated by burner valves; the steam pressure thoroughly atomizes the oil and the oil atoms and steam atoms commingle intimately with the hot air atoms from the furnace and pass from the mouth of the burner in a highly combustible and vaporous form, making pure hydro-carbon gas.

The cost of unloading coal, the waste in handling and the consumption of a certain amount of coal from which no benefit is derived, are urged as obstacles to the economical use of coal. With oil as a fuel, the turning of the valve regulates the whole matter. The Thurman system has been developed by painstaking experimental work and on this fact the promoters base their claim that they are especially well fitted to give intelligent service in the equipment of plants. Their burners have already been placed in some of the largest plants in the country. The general offices of the company are 35 and 36 Cordova Bldg., Indianapolis. E. A. Boldt, 320-322 Broadway, New York, is Eastern agent, and J. Power Hely, 509 Monadnock Block, is Chicago manager.

Personal.

A. T. Paige has resigned as treasurer and general manager of the Paige Tube Works, of Warren, O. E. B. McCrum, secretary, has been elected to the positions held by Mr. Paige and E. J. Bray, superintendent, has been made secretary as well.

C. C. Merritt, one of the three brothers who were the chief developers of the Mesabi range, is seriously ill at Duluth, with little hope of recovery. He started South some time ago but on reaching Chicago thought best to return home. Nervous prostration is his ailment.

Gov. Pattison, of Pennsylvania, had the opportunity, ten days ago, of following pig iron, from Lake Superior ores, through the converting mill and the sheet mill to the final processes that changed it into American-made tin plate. In his visit to New Castle, Pa., he was shown through the Shenango Valley Steel Mill and the New Castle Tin Plate Mill. Gov. Pattison will now be in position to give President Cleveland the light he sought a year ago, when to an English correspondent who said he had come to this country to see an American tin plate plant, the President replied, "If you find anything of the kind please come and tell me about it."

The following standing committees were appointed at the last meeting of the Cleveland Civil Engineers' Club: On Finance—Jno. N. Richardson, C. P. Leland and C. W. Wason. Library—C. H. Benjamin, F. C. Osborn and Walter Miller. Program—Geo. Bartol, A. E. Brown, E. C. Cooke, W. C. Jewett, J. W. Langley, W. W. Sabin and Jared A. Smith.

THE complete novel in the May number of *Lippincott's* is "The Autobiography of a Professional Beauty," by Elizabeth Phipps Train. This work of a little known writer is remarkable for the freshness and brightness of its style. "How I gained an Income," by "A Bread-Winner," records an experience with a lesson that should be useful to many. Under the heading, "Americans Abroad," Hon. Francis B. Loomis, U. S. Consul at St. Etienne, France, tells where our countrymen go and what they spend.

SAND BLAST FOR CLEANING CASTINGS.

Messrs. B. C. and R. A. Tilghman, of Philadelphia, and J. S. Mathewson, of Sheffield, Eng., contemplate establishing in Philadelphia a business which they have successfully prosecuted in England for a number of years—the manufacture and sale of patent sand blast apparatus for cleaning castings. The Sheffield concern is Tilghman's Patent Sand Blast Co., and the three gentlemen named are the sole proprietors. The principle employed is that of using sand as an abrasive by propelling it through a blast at high speed. The company referred to manufacture this apparatus for sharpening and scouring files, removing molding sand, scale, etc., from steel, iron and brass castings, forgings and plates, for cleaning the stone work of buildings, marking and decorating glass, etc.

For propelling the sand, compressed air at from 8 to 10 pounds pressure per square inch is employed. Chilled iron globules instead of quartz or flint sand are used with good results both as to speed of working and cost of material, when the operation can be carried on under proper conditions. With the expenditure of 2 horse power in compressing air 2 square feet of ordinary scale on the surface of the steel and iron plates can be removed per minute. The surface thus prepared is ready for tinning, galvanizing plating, bronzing, painting, etc. By continuing the operation the hard skin on the surface of castings, which is so destructive to the cutting edges of milling and other tools, can be removed. Small castings are placed in a sort of slowly rotating barrel open at one or both ends, through which the blast is directed downward against them as they tumble over and over. No portion of the surface escapes the action of the sand. Plain cored work, such as valve bodies, can be cleaned perfectly, both inside and out. One hundredweight of castings can be cleaned in from 10 to 15 minutes with a blast created by 2 horsepower. Inquiries may be addressed to the Messrs. Tilghman, Philadelphia, or to J. S. Mathewson, managing director, Sheffield, Eng.

Publications Received.

John Adt & Son, of New Haven, Conn., the well known builders of riveting machines, foot presses, roll and rotary wire straighteners, sprue cutters, butt milling, butt drilling and automatic wire-straightening and cutting machinery, have just issued a new catalogue, a copy of which they will be pleased to mail to any interested in machinery such as they build. The excellent plan has been adopted of making the description of each machine complete in itself and each page independent, so that the customer may receive descriptions of just such machines as he is interested in and be saved reading over a bulky catalogue to find what he wants. The catalogue is bound with staples which permit of adding new leaves whenever desired. Some of the company's machines are now undergoing alterations and improvements and will not be illustrated in the catalogue until these are completed. Particular attention is called to the Adt machinery for straightening and cutting wire to accurate lengths direct from coil and to their machinery for hardware manufacture.

We have received from the A. H. Clark Co., of Fond du Lac, Wis., a pamphlet containing illustrations and description of Clark's 1894 improved metallic piston rod packing, which was used by eleven of the exhibiting steam engine plants at the World's Fair.

The Craig-Reynolds Foundry Co., Dayton, O., have recently issued a descriptive catalogue of the Dayton railway crossing gate, manufactured by them, containing two photographs of the railway gate they have just put in for the Big Four system at Elkhart, Ind.

J. A. Fay & Co., of Cincinnati, have issued a small catalogue devoted to wood-workers' machinery supplies, an idea original with this company as far as the wood-working machinery trade is concerned. It gives prices and other details as to all descriptions of these supplies, shafting, hangers, pulleys, etc., with telegraphic code covering nearly all possible subject matter pertinent to correspondence about repairs and fittings calling for quick shipment. This catalogue will be mailed on application.

THE Superior Stove Co., of Superior, Wis., will increase its capital to $50,000, and expects to resume about May 1.

WESTERN FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Western Foundrymen's Association was held Wednesday evening, April 18, 1894, at 225 Dearborn st., Chicago, Ill. In the absence of the president, Mr. C. K. Pittman was elected temporary chairman.

Among those present were the following: Messrs. C. K. Pittman; Geo. H. Sargent, the Sargent Co.; H. O. White, L. W. Lukins, Illinois Malleable Iron Co.; N. C. Fisher, H. S. Vrooman, Garden City Sand Co.; J. Bowie, Walburn-Swenson Co.; John M. Sweeney, General Engineering Co.; O. T. Stantial, Illinois Malleable Iron Co.; H. L. Hollis, Hollis & Emmerton; J. K. Mackenzie, Dickman & Mackenzie; W. Leahy, Wells & French; F. W. Harrower, James Frake; H. O. Skinner, Henry O. Skinner & Co.; J. E. Moore, Cary & Moore; H. T. Murray; Robert Hughes; H. A. Forsyth, Backman & Forsyth; F. B. Whitcomb; A. T. Whiting, S. Johnston, Detroit Foundry Equipment Co.; John H. Blood; J. L. Hecht, Wm. Deering & Co.; M. C. Bullock, M. C. Bullock Mfg. Co.; A. W. McArthur, Rockford Foundry Co.; B. M. Gardner, *The Iron Trade Review.*

The following applications for membership were read and the applicants unanimously accepted as members of the Association: M. C. Bullock, of the M. C. Bullock Mfg. Co., Chicago; E. C. Greenlee of Chicago; Illinois Malleable Iron Works, of Chicago; Antrim Iron Co., of Mancelona, Mich.; Hollis & Emmerton, of Chicago; Matthew Addy & Co., of Chicago.

The Secretary read a paper by Thomas D. West, entitled, "Loss of Iron by Remelting and Slagging." It will be found on another page.

Mr. H. L. Hollis: The main part of the discussion should be taken up in answering some of the questions at the end of the paper. Mr. West has overlooked the ash of all his fuel, I think, in making up his slag. He probably has 10 per cent. ash in his coke, which would come very close to accounting for the 120 pounds that are lacking.

Mr. J. K. McKenzie: This paper does not state what kind of fuel they are using. The ash would amount to any where from 5 per cent. to 12 per cent. Mr. Hollis has taken the average of Connellsville coke. There is liable to be more or less variation on account of the different kinds of fuel. There is another point. In remelting iron there is a loss of silicon. The silicon is converted into oxide of silicon or silica, and goes into the slag as such. This makes the slag weigh more. In melting a large amount of iron it makes quite a considerable weight of slag. The average loss of silicon in remelting iron is 2-10 of 1 per cent. Another point is that the sulphur in the coke partly goes into the iron and some of it goes into the slag. It is an impurity. Also the manganese goes into the slag as oxide of manganese.

Mr. C. K. Pittman: Would these factors make any considerable difference in the amount of slag?

Mr. McKenzie: They do. Then again the hot or cold working of the cupola would make a great difference. I have seen 2 per cent. of iron in the slag worked in a hot cupola; and 16 per cent. of iron worked in a cold cupola. The iron goes into the slag as ferrous silicate. I would like to ask if any one knows how much lime stone is used. My experience would be about 1 to 25 for fluxing iron.

Mr. Pittman: Mr. West says 1,230 pounds to 40 tons of metal, in the last paragraph, about the middle.

Mr. McKenzie: Six thousand pounds of iron to 90 pounds of stone. This is 1 to 66. Is that not very little limestone to use for fluxing iron?

Mr. Sweeney: It has been my practice not to use much limestone. It does not appear clearly in this paper whether the droppings at the bottom are included in the estimate made in the slag loss. The paper does not state so. The paragraph I refer to is in the latter half of the paper, the sentence commencing: "Since this occurrence we have given considerable attention to the slag question, etc." I presume it means it was an equivalent of metalic iron of 20.59 per cent. of the slag. It is going back to the other statement that 33 per cent. of the slag in the other experiment was iron. It looks to me that this was more than any one has ordinarily in his experience. One thing I noticed at the World's Fair was the slag exhibited in the Swedish building. These people seemed to save what we waste and it appears to me that there is one lesson that we ought to learn from these exhibits; namely: that saving in little things is what is largely needed in the foundry business. These people on the other side seem to be a long way in advance in this regard. They use an ore that is not so rich and has to be treated differently. It is necessary for them to economize in little things that we overlook. The chemical gentlemen here would know if that statement is correct. It seems so to me on superficial observation. Do you know, Mr. Hollis, whether the slags that were exhibited in the Swedish building at the World's Fair were particularly free from iron?

Mr. Hollis: I do not recall seeing them.

Mr. McKenzie: It does not seem to me that Mr. West's calculation is quite complete. It hardly seems fair to take one or two heats after you have your cupola in good running order and take the clean weight of metal and clean weight of slag from those two heats and calculate that as your average, when your cupola may be in for two or three days and under these conditions the amount of slag and metallic iron might vary considerably. In dumping a cupola there is an endless quantity of waste material and partly melted stuff containing a large percentage of iron, and that should all go in and be charged up with the weight of the slag, beginning with the first blowing in of the cupola. I do not think it is fair to take two or three heats in the middle of the melt and call that an average. A loss of .33 of 1 per cent. seems very small to a practical man.

Mr. Vrooman; The probability is that the iron was too thin. If it is thicker there will be less in the slag when it comes out.

Mr. Sweeney: Would not the barometrical conditions have something to do with it? One day the atmosphere might be heavy and another day it might be light.

Mr. Pittman: I once heard a furnace man say that if you would tell him the conditions surrounding the furnace he would tell you whether they would make No. 1, No. 2 or No. 3 iron that day.

Mr. Bowie: Our average loss of iron is about 5 per cent., that is running from 15 to 20-ton heats a day.

Mr. McKenzie: What size is the cupola?

Mr. Bowie: Sixty-six inches shell and six inches lining.

Mr. McKenzie: How high?

Mr. Bowie: I think about 40 feet.

Mr. McKenzie: My experience has mostly been with nine-foot shell diameter, and about 24 feet high.

Mr. Bowie: I have never taken any notice whether atmospheric conditions would have any effect on cupolas. In running air furnaces I have noticed a great difference on different days. We had a 20-ton furnace and used to light it about five o'clock in the morning. We used the same iron and the same coal and would have the same men working, and some days the iron would be all melted by eleven o'clock and some days it would not be melted before one o'clock.

Mr. Sweeney: While this discussion is a little wide of the slag question, air furnaces are affected by the way the wind blows, but the cupola is not to the same extent. With air furnaces when the wind blows in one direction the furnace will be very hot and when the wind is in another direction the furnace would be very slow. This is the same in open hearth furnace work and we find the same thing in plate-glass factories.

Mr. Pittman: While this is not properly on the slag question, it bears on it.

Mr. Bowie: Mr. West does not seem to have noted so much the difference in actual weight of the slag as in the bulk of it. It was the bulk of the slag more than the actual weight of the iron or any other material. Perhaps our chemical friends can throw some light on the subject as to what caused it to foam. What was it that made it rise and be light?

Mr. McKenzie: In a general way, as we all know, the foamy appearance of most substances is caused by occluded gases. I have not made any special experiments in this case myself.

Mr. Bowie: The loss is so much less than I have ever been able to obtain and the proportion of limestone is so much less —.31 per cent. less in the heat—and I count myself very lucky when I run down to 3 per cent. The limestone was 1 to 65, when I think in ordinary practice it is 1 to 50 or 1 to 30. Perhaps our chemical friends can tell us if we have been using too much limestone.

Mr. Pittman: I think there is such a thing as using too much limestone and too much fuel both.

Mr. Leahy: On our every day heats we only use limestone about 1 to 50. In regard to the question of foam I think the charging of the cupola has a great deal to do with it. Sometimes the iron and fuel will cling to the sides of the furnace, and in that way will cause it to be foamy. I have had it happen quite frequently where it was not charged properly.

Mr. Pittman: In what way was it charged to cause that foam?

Mr. Leahy: Sometimes I laid it down so the fuel and iron charged too close and did not allow it to come down to the melting points. I have always thought when a cupola foamed that it was not charged properly and I have always found this to be the fact on investigation.

Mr. Hecht: Mr. West puts his loss at 2.50 per cent. and says the slag only explains the loss of .39 per cent.; that leaves more than four-fifths of his iron to be accounted for elsewhere than in the slag. He is inclined to believe that this four-fifths is lost through volatilization. This did not occur to me as being quite likely on account of the temperature of the cupola being too low for that to take place. If the iron were volatilized in the melting zone, surely a greater portion would be condensed and held in the upper part of the cupola where it is cold. Some might be carried over. But four-fifths to be volatilized does not seem to me to be right.

Mr. McKenzie: Do you not think he has taken two clean heats and figured on those rather than on the full run of his cupola? He cannot take any run of the cupola and lose only .33 per cent of the iron.

Mr. Hecht: I would hardly think he would jump at conclusions by two tests like that.

Mr. McKenzie: It does not follow that he left his cupola after these two test in exactly the same condition as when he started his experiment.

Mr. Hecht: I should judge from the care he gave it that he did. I question the accuracy of the explanation from a practical point of view. I think these results really represent what happened throughout the whole run.

Mr. Sweeney: In order to do justice to Mr. West, I think the loss of .33 per cent. and .39 per cent. refer only to the loss of metallic iron through the slag, while the 2.70 cent. refers to the total loss. It seems to me it should not be compared in the way we are comparing it now.

Mr. McKinzie: I see your point.

Mr. Stantial: We keep running without tapping cinder hole for about four, five or six charges.

Mr. McKenzie: Do you plug up your cinder hole or keep it open.

Mr. Stantial: There is a difference; some plug it up and some keep it open. I think Mr. West kept it open some of these days.

Mr. Pittman: It might be well to have the experience of the members as to the amount of limestone used.

Mr. Sweeney: I think the matter of limestone should not be compared as between foundrymen, because the man who melts from fifteen to twenty tons of iron in a day would not have the same proportion as the man who melts from forty to fifty. It is that difference that makes so many different statements. With fifteen to twenty tons I do not think any flux is necessary. The larger the amount of the heat the greater proportion of flux is used. The best place to get statistics about limestone would be in a Bessemer steel plant where the cupolas are kept running constantly and where the comparisons are to some extent alike as between all steel works.

Mr. Whitcomb: I have had some experience in using limestone and I think what makes the iron foamy is too much blast and too much stone. If when the iron foams you will stop the blast for a few minutes you will not have any trouble. A man was once having trouble with his furnace in that way and he came to me for advice. I told him to slack his blast and I did not think he would have any more trouble. He came to me afterwards and said that helped him out all right.

Mr. Stantial: I would not think of using limestone with fifteen to twenty tons. On larger heats we have to use limestone. On large heats running from 45 to 50 tons we use from about 1 to 25 or 1 to 30. I have noticed the foaming but have never paid particular attention to it.

Mr. Sweeney: I believe an excess of blast would cause foaming of the slag.

Mr. Stantial: We have been told to-night that this foaming could be laid to occluded gases. I rather think that it could be laid to air that is contained in it rather than the gases. The air that is blown into it might cause the foam. With a heavy blast on you will notice heavy festoons of mineral wool hanging all over your rafters. I think that is only carrying the thing a little farther.

Mr. Vrooman: Which slag would contain the most iron; the frothy or the solid?

Mr. Stantial: I do not think that it would make any difference whether the slag was frothy or solid as regards its content of iron.

Mr. Pittman: If there was an excess of air would not that cause oxidation?

Mr. Stantial: The air is not acting so much on the iron as on the slag. It is acting on the slag as it passes out of the slag hole.

Mr. Leahy: Our heats average from 60 to 75 and sometimes 100 tons, but on the first few charges put into the cupola we do not use any limestone at all.

Mr. Stantial: Do you count your average on the total in the cupola or only when you use it?

Mr. Leahy: Only when we use it.

Mr. McKenzie: What do you understand the slag to be, a solid slag or a porous slag, something like pumice stone?

Mr. Stantial: Porous like pumice stone.

Mr. McKenzie: I would quite agree with you if it had a spongy appearance. I would distinguish between porous and frothy.

Mr. Stantial: You break that slag in pieces and you will find cavities in it as big as your fist.

Mr. McKenzie: That is on account of the air and would have nothing to do with the stone.

Mr. Stantial: I think it is more air than stone.

Mr. Johnston: I have no experience in running cupolas, but I have kept the records of small heats in some foundries. I have known them to use from 1 to 20 lime stone and the weight would figure up, melting from 150 to 175 tons per day, something like 1 to 25. I would say that we did not have very much scrap, nearly all pig iron.

Mr. Whitcomb: It is hard to tell the exact amount of limestone used. With some stone you would use more than others. There is quite a difference in limestone.

Mr. Pittman: I think Mr. Whitcomb's suggestion that the quality of the limestone is to be taken into consideration, is a good one.

Mr. Whitcomb: I should think that 1 to 35 would be pretty high. In melting, if you are running a big heat in a small cupola, it is necessary to keep the slag running. I mean in taking it out from the slag-hole so that you can see the iron come right down close. If the hole is open and the iron running right down, the blast will throw it out.

Mr. Bowie: Mr. West does not mention the analysis of the iron, as regards silicon, but seems to lay a great deal of the blame of the conditions on the iron and thinks that they had a similar trouble at the furnace where the iron was melted. If this iron was high in silicon, with a strong blast, would there not be a large oxidation of silicon in the iron, and increase the bulk of the slag?

Mr. McKenzie: The oxidation of silicon would increase the weight but not necessarily the bulk. The silica would make it more compact and glassy. It would take away that porous appearance. It would not increase the bulk. When you are melting a hot iron do you lose more silicon than when you are melting a cooler iron?

Mr. Bowie: I rather think you do. We have no chemist and I have no figures.

Mr. Sweeney: In the case that you supposed, with their on containing a small amount of silicon, you used a strong blast. Mr. West says that he used a mild blast. There is quite a scope for discussion here in the amount of blast to be used.

Mr. Stantial: I would like to ask one question: Have any of the members used fluor-spar and limestone in the cupola, and if so, do they consider one better than the other?

Mr. Whitcomb: I have used them both but I could not tell that there was much difference. I do not think there is anything better to use than limestone clear.

Mr. Leahy: I have used fluor-spar some. It seems as if one could get a very fine slag by the use of fluor-spar and limestone both together. I have used them frequently in that way and found I got a very fine slag. In fact I keep the fluor-spar on hand right along, but we do not make a practice of using very much of it except when we run out of limestone.

Mr. Pittman: Do you think there is any advantage in using fluor-spar when you have limestone?

Mr. Vrooman: What objection do you have to it?

Mr. Leahy: The objection I have to fluor-spar is that it contains too much lead. It is pretty hard to get it clean.

Mr. Sargent: I should like to ask of the expense of fluor-spar as compared to limestone.

Mr. Stantial: I have used both of them and I have gone back to limestone as answering the purpose fully as well, with a great saving in the first cost. As regards the comparative cost, I believe limestone can be had for one dollar a ton and fluor-spar from six to seven dollars a ton. Although you can use less fluor-spar than limestone, I never could get it down so cheaply.

Mr. Sargent: I heard of an interesting use for slag. Mr. Getz, of Milwaukee, said he saw it used in Sweden for drying cores. That is not bearing on the question, but it is a matter of interest.

The Secretary then read the following paper:

Cost of Melting.

BY DR. EDWARD G. KIRK.

There is probably less known about the actual cost of melting iron in cupolas for foundry work than in any other branch of the foundry business. But few foundrymen make any attempt at keeping a cupola or melting account. Many of those who do, keep it in such a way that they not only fail to learn the cost of melting, but are misled by the account to suppose their melting costs them a great deal less per ton than it really does. In the majority of foundries the melting is left entirely in the hands of the melter, who as a rule has no system for doing the work, and has no control over his assistants, or interest in having them do a fair day's work. In many of the foundries I visit, twice the number of men are employed as cupola men, as are employed in melting the same amount of iron in other foundries, where the facilities for handling the stock are almost the same, and the expense of lining and daubing material is frequently double with one melter what it is with another in the same sized cupola with the same sized heats.

In many foundries the fuel is not weighed, but is measured in baskets, or the number of shovels counted, and the weight estimated. When the fuel is measured in baskets, the baskets always stretch and enlarge, and an old basket frequently holds one-third more than a new one; from ten to twenty pounds more can readily be piled on the top of a basket after it is filled. Foundrymen who charge their fuel by the basket, always use more fuel than they estimate they are using; when the shovels are counted, each shovel may be made to weigh more than is estimated, and a few extra shovelfulls are always thrown in, for fear some were not full. When too much fuel is used in a cupola, there is not only a wastage of fuel, but there is slow melting, increased destruction of the lining and an increased wear and tear of blast machinery. For these reasons every pound of fuel that goes into the cupola should be accurately weighed. Even when the fuel is supposed to be accurately weighed there should be some check on the melter, for he will shovel in extra fuel if not watched.

At a foundry I recently visited in New Jersey, an accurate account of the melting had been kept for a year. At the end of the year the president of the company had figured up the amount of fuel consumed in the cupola, and compared it with the amount purchased, and found that they were short 260 tons. At another foundry where the melter always reported melting seven pounds of iron to a pound of anthracite coal, they ran short 300 tons in a year. This kind of work should be prevented by checking up the melter's report and comparing it with each car load of fuel consumed. A cupola book should be provided with blank spaces for recording the weight of coal or coke in the bed and charges, and the weight of each brand of iron, No. 1, 2 or 3, and scrap, showing the exact mixture of each charge and heat. A note should also be made of the quality of iron produced from the mixture. Such a record is of great value in making mixtures and charging a cupola if it is properly kept.

The cost of melting per ton is figured in a number of different ways, but to be of any practical value the entire cost of melting should be figured on as follows:

Interest on cost of cupola plant and depreciation in value of same; fire brick for relining and repairs; fire clay, loam and sand for cupola and ladles; repairs to cupola, blast pipe, elevator, scaffold, runway, blower, etc.; belts, oil, etc., for blower; one-fourth the entire cost of engine; tools, wheelbarrows, buckets, hose, shovels, forks, rakes, hoes, sledges, picks, bars, trowels, bod-sticks, tap-bars, etc.; wood for lighting up and dredging ladles; coal or coke consumed in melting; labor employed in removing the dump, making up cupola, milling dump and gates, collecting gates, scrap and bad casting from foundry, placing iron and fuel on scaffold, charging, breaking and piling iron in yard, breaking up bad castings, daubing ladles, etc.

When the cost of all these items has been learned, and the amount divided by the number of tons melted, it will be found that the cost of melting is about $2 per net ton of iron in the ladles.

In foundries with all the modern improvements for handling the stock, the cost is a little less than $2 per net ton; and in foundries with none of the improvements for handling the stock and no system in melting, the cost per ton is as high as $3.

When there is doubt as to the accuracy of weights in charging, the weights should be compared with the fuel purchased and castings sold, and the cost of melting may be figured on the weight of castings sold in place of the amount of iron melted.

To make a cupola report of value, the fuel, labor and tool account should be kept separate, and an effort made to reduce the expense of each account.

Mr. Bowie: I think that the cost of melting iron is generally given as lower than it really is. I have known of cases myself in which when the estimates were made and compared with the amount of fuel bought and the amount reported used, would show a difference of several hundred pounds. Of course it had been used but not taken into account.

Mr. McKenzie: I should like to know in estimating the cost at $2 a ton, how much is for labor and how much for material?

Mr. Bowie: I have not the figures with me but I have them at home, as we paid our melter so much per ton including his labor and fuel. We paid him on the sliding scale according to the size of our heats. He did all the work and was charged for the fuel.

Mr. Whitcomb: I should like to study that question a little. There are a good many items to be taken into consideration. I should say it would cost a great deal more for the labor than for the material.

Mr. Hughes: It seems to me that we cannot compare the large works where they have so much apparatus for handling the material with the small foundries where most of the work is done by hand. The cost of labor would be different. The cost of the plant would also have to be taken into account.

Mr. McKenzie: I wanted to get an estimate in my own mind, if I could, as compared with what I know can be done in a large plant in the East.

It was moved and carried that a vote of thanks be extended to Dr. Kirk and Mr. West for the papers of the evening. The meeting then adjourned.

The S. Obermayer Co., of Cincinnati, were the donors of a box of the Obermayer pencils, which were passed around among the members present at the meeting.

THE sole Western agency for the sale of W. J. Rainey's Connellsville coke has just been placed in the hands of Messrs. Forster, Hawes & Co., 638 The Rookery, Chicago. Messrs. Forster, Hawes & Co., have made arrangements to carry a stock of the Rainey coke on cars on track at Chicago, so that they will be in shape to make prompt shipments on receipt of order. In the hands of this enterprising firm there is no doubt that the Rainey coke will have a large sale, in view of their extensive acquaintance among the foundry trade.

LOSS OF IRON BY REMELTING AND SLAGGING.*

BY THOS. D. WEST.

The last paper by Hon. E. A. Wheeler on "Furnace vs. Foundry Practice," before the Western Foundrymen's Association, Feb. 28, 1894, cites the case of one of his customers losing iron at the slag hole. Not desiring to be considered as thinking myself infallible, I would say that the customer referred to is myself. I should in all probability have kept silent about it, had the statements made not seemed to leave the impression that the cupola workings had made more slag than castings out of the iron charged.

Since the publication of the paper and the discussion thereon, I cannot resist feeling that the slag hole is now causing some founders a good deal of worry. As one foundryman said to the writer, "Just think of it, 22 per cent. of the iron went to slag." Many others, no doubt, have taken Mr. Wheeler's figures in the same light, and if such have survived the shock, they cannot but feel relieved to read these lines.

Before seriously discussing the subject in hand, it is essential that some explanation be made of the elements that have misled Mr. Wheeler in judging of the cause of our slag or the loss of iron, which he cites as occurring in our largest cupola. This cupola is 66 inches inside the lining and by referring to the cut Fig. 1, other dimensions can be obtained. Each heat would then average about 50 tons. The iron we use is all Bessemer pig; no scrap excepting a few "gates," which, for a 50-ton heat would weigh about one ton. Our Bessemer pig runs about 1.60 per cent. in silicon and .030 per cent. in sulphur, .29 per cent. manganese, .092 phosphorus, and Connellsville coke for fuel, of which 2,000 pounds was used for the bed and 450 pounds between charges. The pig on bed was 8,000 pounds and between charges 6,000 pounds. This in a heat of 50 tons would leave us melting at the ration of 1 to 11.24, and if we take into account 300 pounds of coke saved from the dump, it would leave us melting 1 to 11.63. Considering that we use about all pig iron and no light scrap iron to speak of, this I think will be conceded to be "good melting."

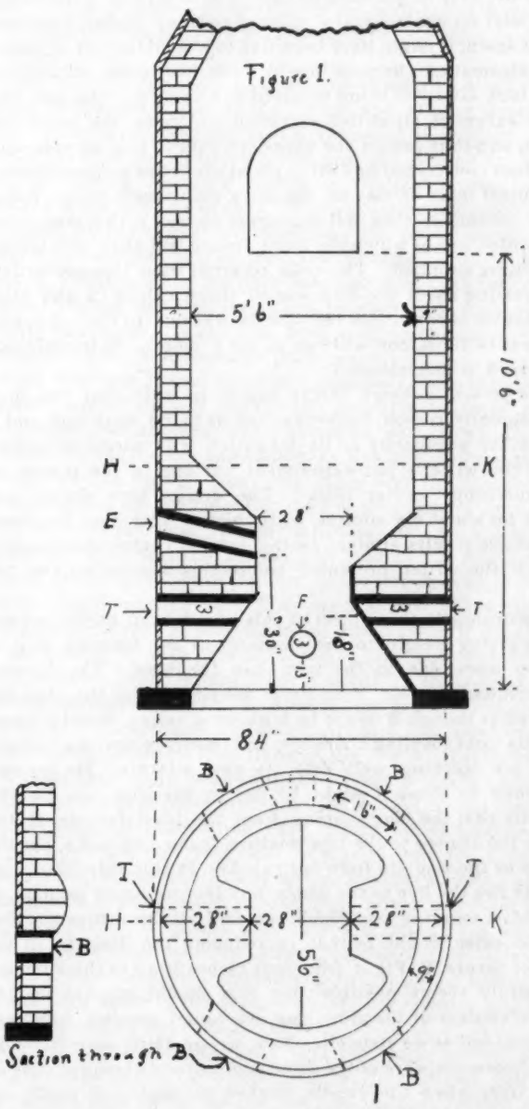
About one year and a half ago, a person was justified in caling the apparatus we now use for melting iron "a cupola;" but since the writer has been experimenting with "center blast," side blast, straight and crooked blasts, (and "getting blasts" about his blast) it is a hard matter to say what one is looking at, for the cupola is so full of holes with branch pipe and offset attachments there is hardly any cupola left. I am strongly inclined to think the above condition has misled Mr. Wheeler in regard to the position of our slag hole and tuyeres, and must say I do not agree with him as to what caused the large extra amount of slag which occurred with us for two or three days in succession. It was one of those occurrences that come but once or twice in a lifetime. The slag when analyzed, was found to contain an oxide of iron equivalent to 26.80 per cent. metallic iron. In addition to this there was 1.97 per cent. of very fine shot iron in the sample of slag selected. This no doubt was the droppings of melted iron, which elsewhere but at the slag hole, would have found its way to the bottom and constituted part of the liquid metal to be drawn off at each tap. The fine shot iron I consider is likely to occur at any heat, the quantity escaping with the slag being dependent on the pressure of the blast and the size of the slag hole. We use a No. 9 Sturtevant fan, revolutions 1400, and the blast pressure raises a column of water nine inches, which I consider a mild blast.

Now had we followed up the matter to find out the percentage of iron lost through the slag on the days in question, it would have been necessary to collect all the slag and from its total weight deduct 26.80 per cent. to obtain the iron lost by reason of the slag, which is one way for iron to disappear. Another good way is by volatilization up the stack. As we did not weigh the slag in these heats, we are unable to give the percentage of iron obtained for the weight of slag received or for the total of iron charged; but we can obtain an approximate idea of the loss of iron of the heat under question by comparing it with the heats presenting the weight of slag as given below, as I do not think the slag on these special days weighed much more than at ordinary times, it was its frothy character that alarmed and deceived us.

*Read before the Western Foundrymen's Association, Chicago, April 18, 1894.

It was not 26.80 per cent of the iron charged that was lost, but 26.80 per cent of the slag coming from the cupola was equivalent to metallic iron. This explanation should cause us to feel a little easier in not thinking all our iron was going to slag. Mr. Wheeler seemed to infer from the slag being black, that the cupola was working cold. It is enough for a foundryman to know that if slag runs freely and there is sufficient to keep two men busy wheeling it away from a cupola, the conditions are just the reverse of being cold. In fact, unless a cupola is working hot, the chances are very unfavorable to drawing off any slag.

As regards the position of our slag hole, F, Fig. 1, I would say, it was exactly the same on the days in which slag was thought to be king as before or after its usurpation to dethrone our profits. I admit calling my friend Wheeler and telling him his iron seemed to be "burning up," and as evidence pointed to the mountain of foaming slag that had run from the cupola; but as I was not quite ready to divulge the secret of my upper tuyere arrangement, I was rather handicapped in freely expressing myself, and left Mr. Wheeler to draw his own conclusions. The reason he advances might be correct enough where one would have such conditions as he cites, but



such was not our case. Nevertheless, it all goes to serve a good purpose, and for one I feel we foundrymen have reason to congratulate ourselves on having such experienced and intelligent blast furnace managers as Mr. Wheeler and Mr. Fry who will take an interest in assisting us to lift the veil that has so befogged intelligent manipulation in the mixing and melting of cast iron. I think the furnace man and we founders have jointly many new problems in this direction to investigate and much guessing at things will be done in the future as in the past until, by persistent investigation and the aid of chemistry, we can work intelligently in knowing

cause and effect. The more we learn, the more will we find science and research necessary to intelligent founding.

Our foundry being about three hundred feet from Mr. Wheeler's blast furnace, affords us exceptional opportunities in observing furnace vs. foundry practice when we desire to do so, and at the time of our creating such an extra bulk of slag, we learned that the furnace had just changed to a new mixture of ores, and this fact rather led me to think something might be wrong with the ores or their working in the blast furnace. For in remelting the iron I never saw such an amount of slag come from all pig iron. As it came out it would foam up in bodies enclosing a gas that would act under it similar to a foaming yeast. I now regret we did not gather and weigh all the slag, for as stated above I am now inclined to think we did not have a great excess in weight over any ordinary heat where the slag runs out and solidifies in a fairly condensed body. But whether it weighed more or not, I do know it occupied fully four times the bulk of what generally comes from such sized heats, and I confess I am still at a loss to fully satisfy myself as to the exact cause. If it was not wholly due to the iron, the only cause I can ascribe it to is an excess of air blowing in through the upper tuyere, E, Fig. 1, which upon the days in question was about four inches in diameter, and later on was gradually reduced to three inches diameter. Then again, it might have been due to a combination of these two elements. The iron might have had some peculiarity that took kindly to being oxidized to a foaming slag, and the little excess of air at this elevation overcame the balancing point, and thus caused the excessive bulk of slag we received. I cannot conceive of any other elements being responsible for the great bulk of slag on the days mentioned, as we had a large amount of coke and limestone on stock, that was from one order, out of which the heats before and after this occurence were supplied. The coke received from this one order, comprising about six cars, was all thrown alone in one pile, so that we cannot think the trouble was due to the coke, and one car of limestone will run us for a month, so it could not be found in that element.

We present a sketch of the cupola in order that you may intelligently reason for yourselves as to its workings, and I know the peculiarity of its formation will attract attention. It is the writer's last experiment but one in the matter of approaching "center blast." The design here shown was used for about six months and achieved very near the commendable results attained by the bottom center blast tuyeres which the writer presented before this association Oct. 18, 1893.

Returning to the subject of this paper, I can hardly refrain from giving weight to the character of the foaming slag as being more due to the iron than the blast. The furnace superintendent, Mr. P. C. Reed, intimated that the slag appeared as though it might be high in alumina, thereby causing its light foaming character, and implying that the furnace was not working well with its new mixture. He seemed inclined to think it might be due to the iron. In fact he admits that the slag coming from the blast furnace at the time the change to the new mixture, foamed up just about the same as the slag did from our cupola. In this coincidence no doubt lies the key to the whole problem, as when we look to the blast entering our cupola, we find all the difference that could exist would be that in reducing the diameter of the upper tuyere, E, Fig. 1, from four inches down to three inches. It hardly seems possible that this should account for the large volume of foaming slag we found coming from our cupola, and as we state elsewhere, we are fairly sure our coke and limestone were of the same composition chemically as on the days when the cupola worked all right. I could not refrain from feeling that Mr. Reed was strongly inclined to think as he stood watching our cupola work that the foaming slag coming from our cupola was due to the iron. It might have paid us to analyze our coke, but knowing it worked all right before and after this event and looked good coke, we did not do this.

Some members of the Associations may have had a similar incident, or through a wider range of experience with foaming slag from clean pig iron could be able to throw light on the subject.

Since this occurrence we have given considerable attention to the slag question, and Mr. Mc Shiras, the chemist, finds by chemical analysis the following weights of iron to be lost through slags: In a heat of 40 tons March 15th, 1894, we had slag coming from the slag hole weighing 1,700 pounds. The analysis showed this slag tocontain 3.34 per cent. of "shot iron," and oxide of iron equivalent to 17.25 per cent. metallic iron, a loss of 350 pounds of iron in the 1,700 pounds of slag, and to the total weight of iron charged, the percentage of loss would be $\frac{3.5}{100}$ of 1 per cent.

Another heat of 40 tons on March 19, 1894, which we followed up showed the slag to weigh 1,630 pounds. The analysis of this gave 2.70 per cent. "shot iron," and an equivalent of 15.69 per cent. of metallic iron, a loss of 300 pounds in 1,630 pounds of slag, and to the total weight of iron charged, the percentage of loss would be $\frac{3.0}{100}$ of 1 per cent., which, figuring the iron at $12 per ton, would show a loss of $1.58, or a little less than 4 cents per ton through the slag running out of the slag hole for a heat of 40 tons, making a loss by this source less than one half of one per cent. of the total weight of iron charged. One factor which it will be profitable to dwell upon before proceeding farther with the paper, is the reason for the difference of loss in the two 40-ton heats. As our metal is carried away from the cupola by a five-ton ladle, and there are often lulls in getting back with the crane ladle, I have permitted the practice of leaving the slag hole open all the time, so as to make sure of the slag or metal not reaching the tuyeres. Feeling satisfied we were losing some metal by letting the blast continually blow out of the slag hole, I decided to try one day with plugging and tapping the slag hole at intervals, or just a few minutes before tapping out. By doing so in the heat of March 19 we learn by the above figures a saving of $\frac{6}{100}$ per cent. of the total weight of iron charged was obtained, or in other words, we saved 29 cents in a heat of 40 tons at the risk of letting the iron or slag fill up the tuyeres, and hence "bung up" the cupola so as to retard melting so that we might lose several hundred dollars in castings through bad melting or dull iron.

Where conditions are favorable to tapping a slag hole at intervals, or just before "tapping out" the iron, the above figures obtained through the aid of chemistry (it is hoped no one will "fly off the handle" at this suggestion) clearly demonstrate the economy of such practice; and it is one that as a general thing can be safely followed; but in cases where the tapping out and plugging up of a slag hole would require a man solely to look after it nothing is to be saved by this practice.

The limestone which we use for a flux proves by analysis to be exceptionally high in carbonate of lime, and we consider it the best we have ever had experience with. For every three tons, we use 90 pounds placed on top of every charge. There is no doubt one or two hundred weight of slag that could be added to the totals given above, which could be gathered from the skimming of the ladle and the dropping of the bottoms. Our apprehension as to loss of iron through slag was allayed when we discovered it was less than one-half of one per cent. It is generally conceded by founders at large that loss through remelting unburnted cast iron ranges all the way from two per cent. up to 10 per cent., so we must look elsewhere than to slags for cause to effect the total loss generally found.

The heavy character and condition of our work will not permit a following after heats to find out the exact loss, and we can only get at it by deducting the weight of the castings made from the amount of metal bought during one year, which is not a bad plan, as at the end of each year we then take a careful inventory of all stock. For the year 1893, we find a a loss from remelting of about 2½ per cent. There are chances, as can readily be seen, of part of this being lost in the way of fine scrap mixed with shop sands and dirt, and also wheeled out with the cinder and tumbling barrel refuse, and hence it would not be right to attribute it all to loss by melting.

As to whether we can burn iron I am not prepared to say; but we can look to oxidation and volatilization for the greater percentage of loss in remelting iron, and the above figures would lead us to believe that the greater loss was by way of the stack. I do think that an excessive blast does more in oxydizing and volatilizing the metal in a cupola and thus causing a loss than is generally conceded, and I also believe that the greater part of the oxidation or "burning" of the metal as commonly termed, is done above the tuyeres, as the

metal is dribbling from the "melting point" through the fuel down past the tuyeres to the bath of metal in the bottom, and also from the surface of the metal above the tuyeres at the melting point, as it momentarily exposes a semi-molten surface to the effect of the blast.

I do not accept the idea Mr. Wheeler advanced of the surface of the liquid iron or bath being exposed by being freed of slag, and thus causing the extraordinary character of our slag on the days above cited. If that occurrence was due to our blast and not to any fault of the iron used, I would then say it was caused by an excess of air in the upper tuyere E, Fig. 1. This idea cannot but suggest the question, are upper tuyeres according to their area larger promoters of oxidation and volatilization than lower tuyeres? My study of the problem would lead me to say that they are, and I think this is another question for the Association to take up, letting chemistry lend its aid in solving the problem, for if we are saving a little fuel at a greater loss in iron, I think we all want to know it.

I also think there is another feature of this subject that will bear discussion, and that is this: Will not some clean irons oxidize and volatilize faster than others? Of course I mean this question to be chemically considered. We all know that the more surface we expose to the effects of blast and heat the faster the oxidation. And hence with light scrap iron we must expect the greater loss. But take our case, where one is using all good clean pig iron, we might put the question, are there not chemical compositions in some pig metals more favorable to oxidation and volatilization than with others? Then, again, another question that will bear investigation, is, What does slag come from? Taking the case of the first 40-ton heat cited above, we find that 350 pounds of iron and 1,230 pounds of limestone were used for that heat, which we might figure as chiefly constituting the 1,700 of the slag found, thus leaving us 120 pounds to account for. To cause thought and further discussion I will ask, what does this 120 pounds chiefly come from? Scale of the iron, lining of the cupola or impurities of the fuel? A study of these questions will be a check to prove that slag has other elements than iron to largely cause its creation as weight. I would here "head off" any who might think to suggest our lining as being the cause of the slag, as that showed no unusual wear or burning out. I cannot but think that a discussion of all the above questions will prove valuable to us all. At least, I know that preparing this article has led the writer into several new channels of thought which will be personally beneficial. There are reasons why one founder should be losing 10 per cent. and another only two per cent., in remelting cast iron, and a thorough ventilation of the subject by the members of our Eastern and Western Associations surely could not but be profitable to all concerned.

POINTS AS TO SOUTHERN INVESTMENTS.

TO THE EDITOR OF THE IRON TRADE REVIEW:

Attention has been called from time to time to the Southern States and the advantages they offer to investors. That these States possess wonderful resources is being fully shown by the developments of each year. Nearly all minerals are to be found in them. Besides thousands of acres of land containing many kinds of valuable timber, untouched by the hand of man, are immense coal and iron mines which are a source of much wealth to many and furnish work to thousands of men. Added to these are all kinds of stone and many varieties of marble, with clay and limestone and other products of very great value. The price of land now varies from $2 to $10 an acre. This covers all kinds of mineral and timber lands. The value of timber lands increasing every year, adds to the wealth of Southern land owners, as the demand for Southern lumber from the North increases every year. The depression which has existed in this country for months, has reduced the price of all kinds of stocks and bonds and other securities and made investments in them very far from being desirable or profitable. As some slight improvement is now and then seen in the general condition of affairs in the country and some brighter light breaks through the dark clouds, investors are looking around to see where they can use their spare money to advantage. Some are settling upon investments in desirable properties to be found in the Southern States Large amounts of money are still lying idle, the owners being uncertain where to use it to good advantage and where it will be safe, with hopes of fair returns. In this state of the case the writer desires to call attention to the valuable timber and mineral lands to be found in several of the Southern States. While the South has had its ups and downs and its booms of prosperity and succeeding depression, it is still having its share of prosperity with other sections of the country, and its present development is still in its infancy.

One who has been most active in seeking to develop the South in this direction is Mr. E. C. Robertson, of 170 Race st., Cincinnati. Mr. Robertson has control of large tracts of land in Tennessee, Arkansas, Alabama, Texas, Louisiana, Mississippi, Florida, Virginia, West Virginia, the Carolinas, and Pennsylvania. On these lands can be found large quantities of long leaf pine, cypress, poplar, oak, maple, hemlock, walnut, and other kinds of timber, all of which is now extensively used in building and many manufacturing purposes and finds a good market at home and abroad. On many portions of his land are also to be found valuable deposits of coal, iron, zinc, gold, lead, talc, mica, phosphates, stone, limestone and clay. What has been done in Michigan and Wisconsin in timber and mineral lands can be done in the South in the coming 20 years. Large quantities of these lands are still being bought up by moneyed men who can hold them, to be sold in the future for higher prices.

At the World's Fair, Arkansas received an award for her exhibit of carbonates of zinc in the mines and mining department. Some of the best soft coal shown—and it received an award—was from the Imboden mines near Big Stone Gap, Va. The Flat Top coke from that section of the country received an award in the exhibits of coke. North Carolina was specially recognized for her exhibit of minerals. The fastest steamers on the ocean use coal coming from the far-famed Pocohontas mines of Virginia. It is not only less expensive than the anthracite coal, but burns up very clean, has but little soot, and is nearly smokeless. It has also been used quite extensively for manufacturing and domestic purposes.

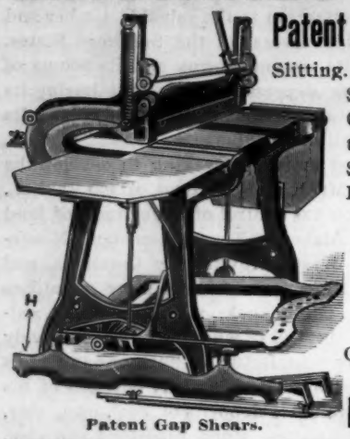
People who have looked into these questions claim that the remaining timber lands of this country cannot meet the permanent needs; that not many years hence we will have to look elsewhere for our lumber and timber, as England, France and Germany are now doing. For three years past the Southern lumber business has increased in larger proportions than it had for 20 years previous. Southern timber lands are still low as compared with Northern lands. The land in the North is now sold by the quantity of lumber in the tree instead of by the acre. Land once selling at $1.25 per acre now brings from $30 to $100 per acre. In judging of the actual value of Southern as compared with Northern lands, due consideration should be given to the lasting value of Southern lands for agricultural purposes. Joseph R. Brown, late president of the Chamber of Commerce, of Cincinnati, O., says the Southern people are now better off than those in the North; that it cost less to plant their crops last year than ever before. "They have sold their products at more profit, and have lived at less cost. From my personal observation, they are in better condition than you are here, and 1894 will be a good year for them. Those who sell in the South will not suffer loss in doing so. We have been hearing much of the New South and what is being done there. It means that they are doing away with old things, new blood is being infused into their system, taking hold of new ideas and impressions, and pushing forward to secure their share in the prosperity of this country which for many years had not been theirs."

The *Northwestern Lumberman* says the large amount of capital invested in Southern pine land in the past two years has increased their value of a few years ago so that, selling at $1.25 and $2.50 per acre, they are now held at $10 per acre. Indications show that buying Southern timber and mineral lands is one of the best investments capitalists can now make.

J. P. G.

ON another page we print the advertisement for the first time of Messrs. Dawson & Goodwin, the new firm dealing in new and second hand metal working machinery at 57 S. Canal st., Chicago. Messrs. Dawson & Goodwin, while new as a firm in the business, have each of them had a long experience in the sale of machinery, and having an excellent stock on hand are able to take good care of the large business that is already coming to them.

MACHINES FOR WORKING SHEET METAL

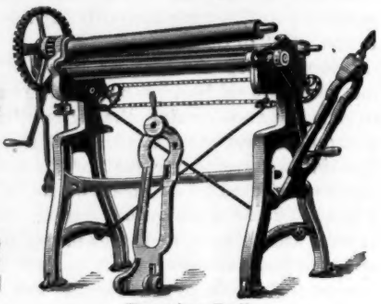


Patent Gap Shears.

Patent Gap Shears, Especially designed for Squaring, Trimming and Slitting. 6 to 18 inch throat for Slitting Wide Sheets, Complete for Tin or Iron to 14 gauge. Seven Styles of various lengths HAND AND POWER.

General Purpose Punch and Shear. Seven Sizes.

Rear Side.



Forming Rolls.

General Purpose Forming Rolls, all sizes. Quickly adjusted and instantly opened—A Revolution. Also Patent Crimping Rolls. Beware of Infringements.

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FIRE BRICK, FIRE CLAY,

For Blast Furnaces, Cupola Lining, Boiler Setting, Smoke Stack Lining, or Any Other Purpose.

EVERY CLASS OF SPECIAL SHAPES AND SIZES.

ALL KINDS OF

Foundry Supplies.

FACINGS, BLACKINGS AND MOULDING SANDS

Of All Kinds.

INDUSTRIAL SUMMARY.

New Enterprises:—

The following recent incorporations, specially reported for *The Iron Trade Review*, are of interest to the iron and machinery trades:

Milwaukee, Wis.—The Improved Sewing Machine Needle Co.; capital, $250,000; for manufacturing sewing machine needles; incorporators: P. Reuter, G. J. Reimer, J. M. Farmer. Address letters care of The Improved Sewing Machine Needle Co., Milwaukee, Wis.

Cleveland, O.—The Permanent-Rail-Joint Co.; capital, $100,000; for manufacturing, buying and selling all manner and kinds of railway material and supplies; incorporators: J. K. Bole, E. C. Pope, Jno. L. Pope, C. B. Smith, E. A. Angell. Address letters care of E. A. Angell, Cleveland, O.

Granite City, Ill.—American Steel Foundry Co.; capital, $300,000; to manufacture, handle and sell steel or other castings for railway or other purposes; incorporators: Edw. F. Goltra, Jas. F. McRoberts, Valle Reyburn. Address letters care of Edw. F. Goltra, 509 Olive st., St. Louis, Mo.

Montpelier, Ind.—The Montpelier Sheet & Tin-Plate Co.; capital, $200,000; for manufacturing tin-plate, black plate, tin, bar steel, etc.; incorporators: Monroe Seiberling, Chas. A. Ford, Kokomo, Ind.; Carl W. Kolbe, A. Walme, David Moser, Montpelier, Ind. Address letters care of C. W. Kinnan, Montpelier, Ind.

Columbus, O.—The World Mfg. Co.; capital $100,000; for manufacturing and dealing in all kinds of foundry work, machinery, engines, boilers, electric motors and dynamos, telephones, novelties, etc.; incorporators: Wm. P. Harrison, Henry F. Gray, Henry A. Williams, Louis G. Addison, Lincoln Fritter. Address letters care of Nash & Lentz, Columbus, O.

Centralia, Ill.—The Roaks Cabinet Co.; capital, $20,000; to manufacture and deal in the combined air brake valve, kitchen and grocery cabinet, secured by letters patent to A. N. Roaks and Wm. Tweed, Oct. 31, 1893; manufacture and sell all kinds of furniture; incorporators: G. E. Eis, I. D. Lear, H. H. Rainey. Address letters care of Frank F. Naleman, Centralia, Ill.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review* and we will put you in communication with our advertisers at once.]

Hayes & Tracy, 45 Lake st., Chicago, want to buy a portable boiler of from 60 to 90 horse power.

The Cordele Machine Shop, Cordele, Ga., will purchase an almost complete foundry and machine shop equipment.

The Cambridge Foundry Co., Cambridge, O., are in the market for a 25 to 30 h. p. engine, line-shafts, pulleys, planer, lathe, and general tools for machine shop.

The Glamorgan Co., Lynchburg, Va., whose plant burned some time ago, will have to buy complete outfit of machinery and foundry equipment for its new plant. The company is founder and machinist, manufactures cast iron pipe, mining machinery, etc.

New Construction:—

The Kelly Axe Mfg. Co., Alexandria, Ind., haae nearly completed their new works.

The King Bridge Co., Cleveland, have the contract for a $20,000 steel suspension bridge at Grenada, Miss.

The National Car Wheel Co., of Buffalo, will soon begin the erection of a foundry plant which will have a complete modern equipment.

The Emlyn Steel & Tin Plate Co.'s plant at Summitville, Ind., will be completed early in May. Their capacity will be 150,000 boxes of tin plate a year.

A new high level bridge is to be built across the Ashtabula river at Ashtabula, O. It will be 40 feet wide and 1,000 feet long and 105 feet above the river. The estimated cost is $80,000.

At Johnstown, Pa., the Cambria Iron Co. have about completed their new steel rail mill. Its capacity is 1,500 tons every 24 hours. A special feature in the mill's construction is the means by which rails may be cut at any desired length or angle. The capacity of the old rail mill was 500 tons a day.

The McNeal Pipe & Foundry Co., of Burlington, N. J., have placed the contract for two cleaning sheds with the Berlin Iron Bridge Co., of East Berlin, Conn. The latter firm have also received from Dr. Drysdale, of Philadelphia, the contract for an iron roof over the new power house for the hospital for the insane, at Norristown, Pa. Ordinary corrugated iron could not be used on account of the drip, so that the roof will be covered with the Berlin Iron Bridge Co.'s patent anti-condensation corrugated iron covering.

Additions, Enlargements, Removals, Etc.:—

The Lexington (Ky.) Stove Co. are building an addition to their foundry.

Shaw, Kendall & Co. are building an addition to their foundry at Auburndale, O.

The citizens of Oelwein, Ia., have agreed to build a repair shop plant costing $200,000 for the Chicago Great Western, and the company has decided to accept the proposition and remove its shops to that point.

Muncie, Ind., gains the Patton Mfg. Co., of Columbus, O. The buildings include the enameling and machinery department, 400x60 feet; foundry, 400x120 feet, with a wing 100x150 feet; wareroom and packing department, 400x60 feet.

The Continental Wire Co., of St. Louis, will move their plant to Granite City, Ill. Ground will be broken May 1 and

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick.

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Fire Brick.

High Grade Fire Brick for Melting, Heating and Blast Furnaces.

CUPOLA LININGS, BOILER SETTINGS AND ALL PURPOSES FOR WHICH FIRE BRICK ARE USED—ALL SHAPES.

Ground Clay in Bulk or Sacks. Send for list of shapes.

THE AMERICAN FIRE BRICK & CLAY CO., Mineral Point, Ohio.

When you write to firms advertised in our columns, please mention the fact that you took their address from our paper. They will thank you for it.

the plant will be occupied three months later. The buildings for wire drawing and barbing department will be 400x500 feet. A rod mill will be put up later.

The Phœnix Iron Works Co., of Cleveland, are about to begin work on an addition 60x75 feet, two stories high. The lower floor will be served by an electric crane. Latterly it has been necessary to run day and night in order to take care of orders for the foundry cranes, of which these works make a specialty.

Fires and Accidents:—

Thos. Sharp & Co.'s foundry and machine shop at Salem, O., burned April 22. The loss was almost total.

The factory and tinwork machinery of John D. Hass and Franz A. Assman, at No. 128 Jane st., New York, were destroyed by fire April 19, the loss being estimated at $70,000.

The Logan Iron & Steel Works near Lewiston, Mifflin Co., Pa., were almost completely destroyed by fire April 17. Loss estimated at $100,000; partly insured. One hundred men have been working of late.

The roof of the old Speedwell Iron Works at Morristown, N. J., was on fire April 20 and the firemen had difficulty in saving the building. It is a historic structure, built at the close of the Revolution. On the second floor of the building Prof. S. F. B. Morse and young Alfred Vail worked to perfect the electro-magnetic telegraph instrument. In 1836 the first successful tests were made, and the nails used to support the wires are still sticking in the beams and joists. In the same building the machinery for the steamship Savannah, the first to cross the Atlantic, was built, and the wheels of the first American-built locomotive were made there. The bell in the belfry was cast before the Revolution. It was cracked in the fire last week and will be recast.

General Industrial Notes:—

Rails are now made in 33-feet lengths instead of 30 feet, at Edgar Thomson.

The car shops and all departments of the Carlisle Mfg. Co., at Carlisle, Pa., have closed down.

Part of the Union Iron & Steel Co.'s rolling mill, at Girard, O., started up Wednesday, April 25.

The Union Rolling Mill Co., of Cleveland, has closed down its mill on account of lack of orders.

The Lebanon Mfg. Co., Lebanon, Pa., discharged about 200 men. A few small orders are on hand.

Two furnaces of R. H. Coleman, at Lebanon, Pa., out of blast two years, were blown in April 19.

The West Side stove works, of the Girard Stove & Foundry Co.'s plant, Girard, O., started up in full April 23.

The Andrews & Hitchcock Iron Co.'s furnace at Hubbard, O., has blown out, with 14,000 tons of pig iron in stock.

We are informed by the Ellwood Tin Plate Co., of Ellwood City, Pa., that their plant is nearly ready for operations.

The Watts Steel & Iron Works, at Middlesborough, Ky., will start up in 60 days and give employment to 600 men.

Bar mills Nos. 1 and 2, 8-inch and 10-inch mills and 33 puddling furnaces are being operated at Olivers' Tenth street plant, Pittsburg.

The Haskell & Barker car works, at Michigan City, Ind., resumed work last week, in all departments. Six hundred men are employed.

Shoenberger, Speer & Co., have contracted for an auxiliary Massick & Crooks hot blast stove, 18x65 feet, for the Schoenberger furnaces.

The orders for billets on which the Edgar Thomson steel works ran last week have been filled and the rolling of rails will be resumed.

Vesuvius furnace in Lawrence Co., O., will be put in blast soon, and run on cold blast charcoal iron. The Vesuvius Iron Co. have leased it.

The North Reading foundry of the Reading (Pa.) Foundry & Machine Co. has resumed with 100 hands after an idleness of several months.

The J. Painter & Sons Co., Pittsburg, have just put in operation their new 8-inch hoop mill, which has a capacity of 25 tons of hoops a day.

Twenty puddling furnaces, the entire plant, are being worked single turn at the Monongahela Iron & Steel Co.'s works, Hay's Station, Pa.

Every department of the Andrews Bros. Co.'s mill at Haselton, O., started up April 23. In the puddle department there are four furnaces not working.

The Wilkes Rolling Mill Co.'s plant at Sharon, Pa., has been closed down for some time, there being no demand for its product, which consists of muck bars.

A brass foundry has been started at Youngstown, O., by Gus A. Doeright and Bert Booth. The former has been in the employ of the Youngstown Brass Works.

The Brown-Bonnell Iron Co., Youngstown, O., has been running in every department of its plant except its No. 1 mill

the past week. Several good orders have been received of late.

The Brooks Locomotive Works, which expected to close down last week, has received orders for four engines. Only 200 men are employed, about 1,200 being out.

At Duluth, in the cases against the Minnesota Blast Furnace Co., the court finds the Babcock & Wilcox Co. entitled to a lien for $5,000 and Wm. Tod & Co. for $8,186.75.

The American Machinery Co., of Detroit, Mich., is enjoying an excellent export business, sending abroad over 100 of their No. 2 universal trimming machines every month.

The Keystone Rolling Mill, Pittsburg, which has 36 single puddling furnaces and seven heating furnaces, is working full in puddle and finishing departments, except the plate mill.

With the retirement of Edmund L. Levy from the Neafie & Levy Ship & Engine Building Co., Philadelphia, the announcement is made that he will probably start a new yard.

Reynolds & Co., New Haven, Conn., manufacturers of cap, set and machine screws, after running half time for some months, now have their full force at work nine hours a day.

The Pottsville (Pa.) Iron & Steel Co. has secured the contract for the structural material that is to go into the $300,000 storage sheds the Lehigh Valley Co. is about to build at Superior.

The citizens of West Newton, Pa., have raised $20,000 to buy land north of the town, so as to be able to offer a free site to an agricultural implement plant negotiating to remove to West Newton.

The Akron (O.) Drop Hammer Forge Co., at their first annual meeting April 21, elected Joseph Cook president, J. W. White vice president, and J. D. Jones secretary, treasurer and general manager.

The Spicer Mfg. Co., New Philadelphia, O., shipped last week 25 special trucks to the Caldwell & Peterson Co., Wheeling, W. Va. This truck is specially designed for handling the product of this company.

The Youngstown Iron & Steel Co.'s Girard, O., mill is working 14 furnaces out of 27. The work is divided so as to make four sets to each furnace, and in the past four months there has been a total of 11 days for each turn.

The removal of the Heath Rail Joint Co., from West Superior, Wis., to Chicago Heights, Ill., is due to the trouble at the West Superior steel plant. The plant at West Superior will be run about a month more. The company have orders in sight that will require 700 to 800 tons of steel.

At Muncie, Ind., the Indiana Iron Co., the White River Iron & Steel Co. and the muck bar company (operating the old nail works) are running intermittently. The Indiana Iron Co. are operating six furnaces, scrap and swarth, and four puddling furnaces. The muck bar mill has run about 15 days in the month.

The Alabama Rolling Mill at Gate City, Ala., has an average daily capacity of 75 tons. Since early December it has been in operation, with the exception of a few days. The puddling department has been working three turns daily of five heats each and is now on double turn, six heats a turn.

The Daniels Steel Railroad Tie Co., Youngstown, O., has been incorporated with a capital stock of $50,000. Robt. Daniels is president, and Thomp. Burton, secretary, treasurer and general manager. Daniels, the inventor, is boss roller at the Valley mill, and runs a roll that makes these ties.

The Birmingham (Ala.) Iron Works were sold by the receiver April 16, and bought in by R. M. Wallinsey, President of the Louisiana National Bank, New Orleans, as trustee for bondholders, at $50,000. The plant consists of machine and foundry works and will go ahead on orders already booked.

Their foreign trade has always been an important factor in the business of J. A. Fay & Co., Cincinnati. They have just received a large order from Havana, Cuba, which will require three months to fill. It comprises an outfit for furniture making, wagon and car building, and a planing mill equipment in addition.

Sales of 8,000 to 10,000 tons of wrought iron pipe of an aggregate length of 113 miles have been made for Western delivery by the Chester Pipe & Tube Co., of Chester, Pa. The iron will be furnished by the Pottstown Iron Co., Glasgow Iron Co. and Potts Bros. Iron Co., of Pottstown, and the order will keep their skelp departments busy for some time.

The owner of the big steam shovel made by the Vulcan Iron Works Co., of Toledo, O., illustrated in the last issue of *The Iron Trade Review*, informs the manufacturers that he is digging in 14 feet of ground, making 26 feet bottom and depositing all the material on one side. This shovel is employed in phosphate operations by C. H. Drayton, at Charleston, S. C.

The Detroit Twist Drill Co., recently organized at Detroit, succeed to the business of the Graham Twist Drill & Chuck Co. The following are the officers: Wm. Reid, president; Harry S. Hodge, vice president; N. G. Williams, Jr., secretary; Chas. M. Swift, treasurer and general manager. Henry F. Hiller continues as superintendent, while Donald Churchill will represent the new company among the trade. The works possess greater facilities than ever for making drills, chucks and kindred tools.

The Falcon Iron & Nail Co., of Niles, O., part of whose product is sheet iron and steel, have gone into court to enjoin the city from issuing $10,000 bonds to secure the establishment of the sheet mill which R. G. Sykes, the well known manufacturer of iron roofing proposes to build there. John Warner, Jr.,

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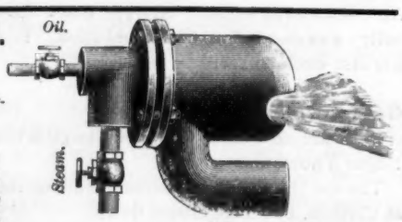

Hot Air from Furnace.

BURNER NO. 4.

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J. POWER HELY, Chicago Manager, 509 Monadnock Block, Chicago, Ill.

NOTE.—If you are using oil as fuel, and are not getting good results, we would be pleased to send you our burners on trial. The oil in our burners can be atomized by either steam or air.

assistant superintendent of the Falcon Iron & Nail Co., who was to be associated with Mr. Sykes in the new enterprise, has been persuaded to withdraw from it. Mr. Sykes announces, however, that another man will be be secured and that the enterprise will go on, even though the city does not issue the bonds.

A very satisfactory meeting of the stockholders of the Joseph Dixon Crucible Co. was held at their offices in Jersey City, N. J., April 16. Out of 7,345 shares 7,215 votes were cast for the same board of managers that has conducted the affairs of the company through its years of prosperity. The vote was a decided compliment to the members of the board, as were also the remarks of some of the largest stockholders. The board consists of E. F. C. Young, John A. Walker, Daniel T. Hoag, Richard Butler, William Murray, Joseph D. Bedle, Jerome D. Gillett. E. F. C. Young was elected president; John A. Walker, vice president and treasurer; George E. Long, secretary. The Dixon Co. was founded by Joseph Dixon in 1827, and organized as a stock company in 1868. Its manufactures are graphite products of all kinds, consisting of plumbago crucibles for melting gold, silver, brass, etc., blacklead retorts, stove polish, graphite for lubricating, electrotypers' graphite, graphite lead pencils, graphite paint, and graphite prepared in hundreds of ways for as many different uses.

At West Superior, Wis., a receiver has been appointed for the West Superior Iron & Steel Co., on the petition of the Northwestern Iron Co., of Milwaukee. The Land & River Improvement Co., of West Superior, was the largest creditor of the steel company. Francis Henry Weeks, one of the promoters of the Land & River Improvement Co., was heavily interested in the steel company, and as president of the land company advanced the steel company about $400,000, giving the land company notes from the steel company. When Weeks went down the land company attached one plant of the steel company to satisfy its claim, and numerous smaller attachments have since been filed. J. D. Rockefeller holds $1,750,000 of first mortgage bonds against the steel company. The plant was in successful operation about one year. It supplied steel plates and angle iron for about twenty whalebacks, and the pipe department turned out large orders of iron, culvert pipe, sewer pipe and the like for the Northern Pacific and Great Northern railroads. The original plan was to construct a $5,000,000 plant, including a blast furnace and rail mill.

THERE were put in the yards of the American Pig Iron Storage Warrant Co. in the 10 days ending April 20, 500 tons and 100 tons were taken out. Stock in yard April 20 was 96,600 tons.

THE net earnings of the Tennessee Coal & Iron Co., for March are estimated at $67,900; fixed charges, $59,700; surplus $8,200.

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Manufacturers of MINING MACHINERY.
HEAVY ROCK CRUSHERS FOR IRON ORE
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NEW AND SECOND HAND
MACHINE TOOLS.

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Send us a sample or drawing of what you want stamped or blanked, or what you want to stamp or blank, and we will quote you prices on the article, or on the machinery to make it.

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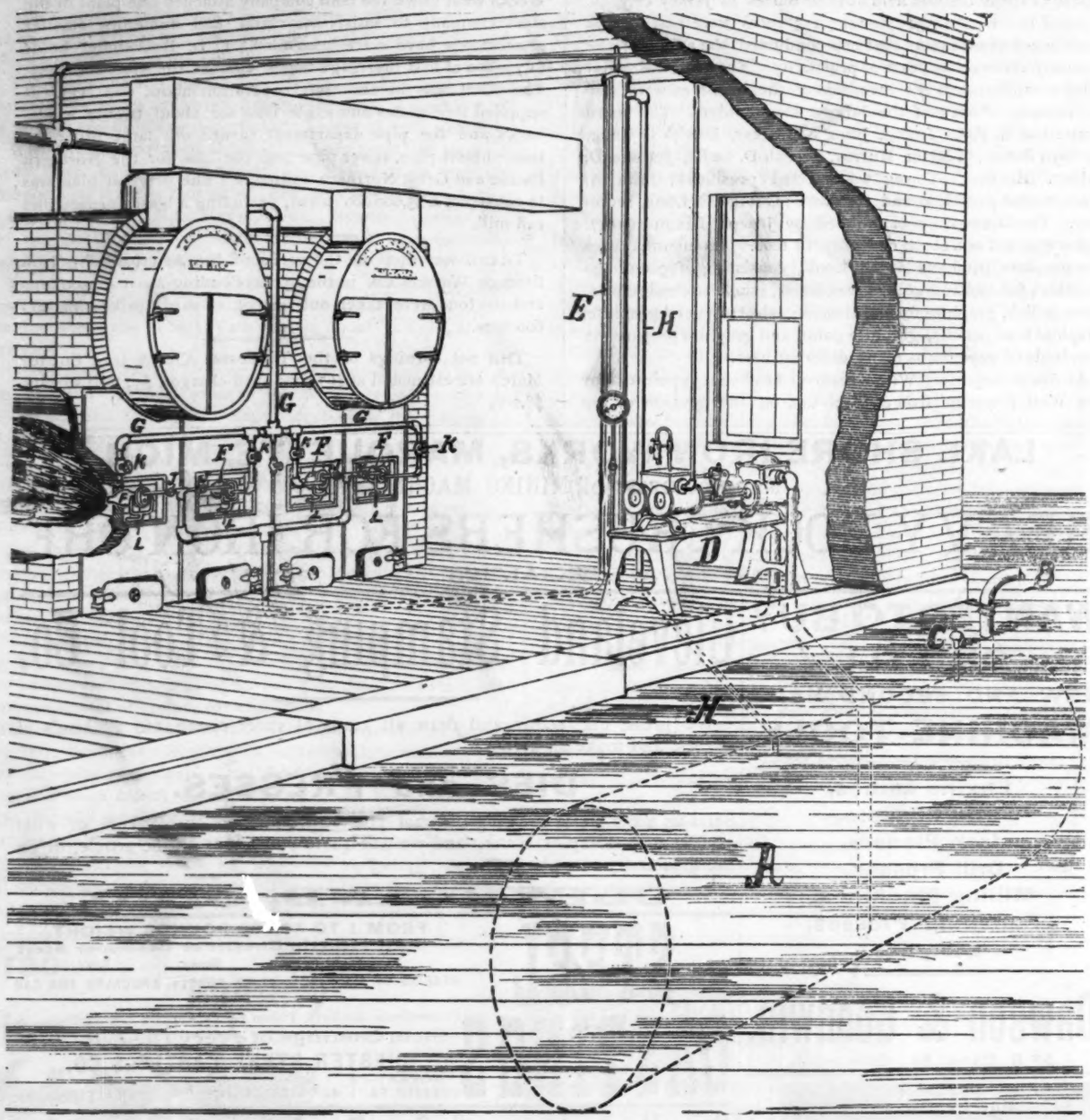

A is the storage tank, which is placed under ground and outside of the building and has the supply inlet B. C is the vent pipe from tank. D is the oil pump, which pumps the oil from the tank A, into the stand pipe E; the oil flows by gravity pressure from this pipe to the burners F, F, F, F, where it is atomized by a supply of steam from pipes G. The stand pipe E has an overflow pipe H, back into the tank A, which prevents the stand pipe from overflowing, thus keeping a regular oil pressure. J, J, J, J, are the oil valves, and K, K, K, K, are the steam valves.

The proportions of oil and steam are regulated to any degree at will by burner valves J and K, the steam pressure thoroughly atomizes the oil, and oil atoms and steam atoms intimately commingle with the hot air atoms from the furnaces through the pipe L, and pass from the mouth of the burner in a highly combustible and vaporous form, thus making pure hydro-carbon gas, which burns like a gas flame with perfect combustion. The oil in our burners can be atomized by either steam or air pressure.

Our system of burning crude oil is adapted to all classes of work, such as boilers, reverberatory furnaces of all kinds. Copper and brass are melted in crucibles at one-half the cost of coal, and the crucibles are more permanent. Puddling, forges, dryers of all descriptions. Glass making and working are successfully accomplished with large savings in fuel. Burning brick, tile and pottery of all kinds. Our burners generate pure hydro-carbon gas, and wherever used every unit of heat the oil contains is utilized and applied without any expensive intermediate process of treatment. Our system is accepted and endorsed by the leading insurance companies of the country.

Our method of producing hydro-carbon gas is the greatest improvement that has been brought about by the introduction of crude oil, as a substitute for coal as fuel. Its success as a heat producer is no longer an experiment, but a fact established beyond all doubt. It is a clean, convenient and economical fuel, producing the required results.

Its numerous advantages over coal will readily be appreciated from the following important facts: The trouble attached to the handling of coal It costs at least five cents per ton to unload, providing you have a switch to your bins and yet it has not been distributed about the plant. There is a shrinkage of five per cent. in weights, and about the same in waste by handling. Then it is an impossibility to burn and not consume a certain amount of coal from which no benefit is derived, caused by the necessity of opening the doors, and cold air rushes in, causing an immediate and reverse change to take place, while with oil, if your fires are too hot, turn a valve, save your fuel.

The labor of feeding the fires, clinkering the boxes, taking care of ashes and the wear on boilers, kilns, etc., are unknown in the use of oil.

One car of oil is equal to three cars of coal, and by attaching a rubber hose or gas pipe, in two hours you have obtained the results of the labor of one man for one and one-half days, and only consumed about ten minutes in preparing for the operation of unloading, which afterwards needs no attention. By the aid of a pump, your fuel is distributed and always ready for use.

It is obvious that our system is the simplest, and has the advantages over our competitors by generating pure hydro-carbon gas by the direct use of the crude oil, and needs no further discussion.

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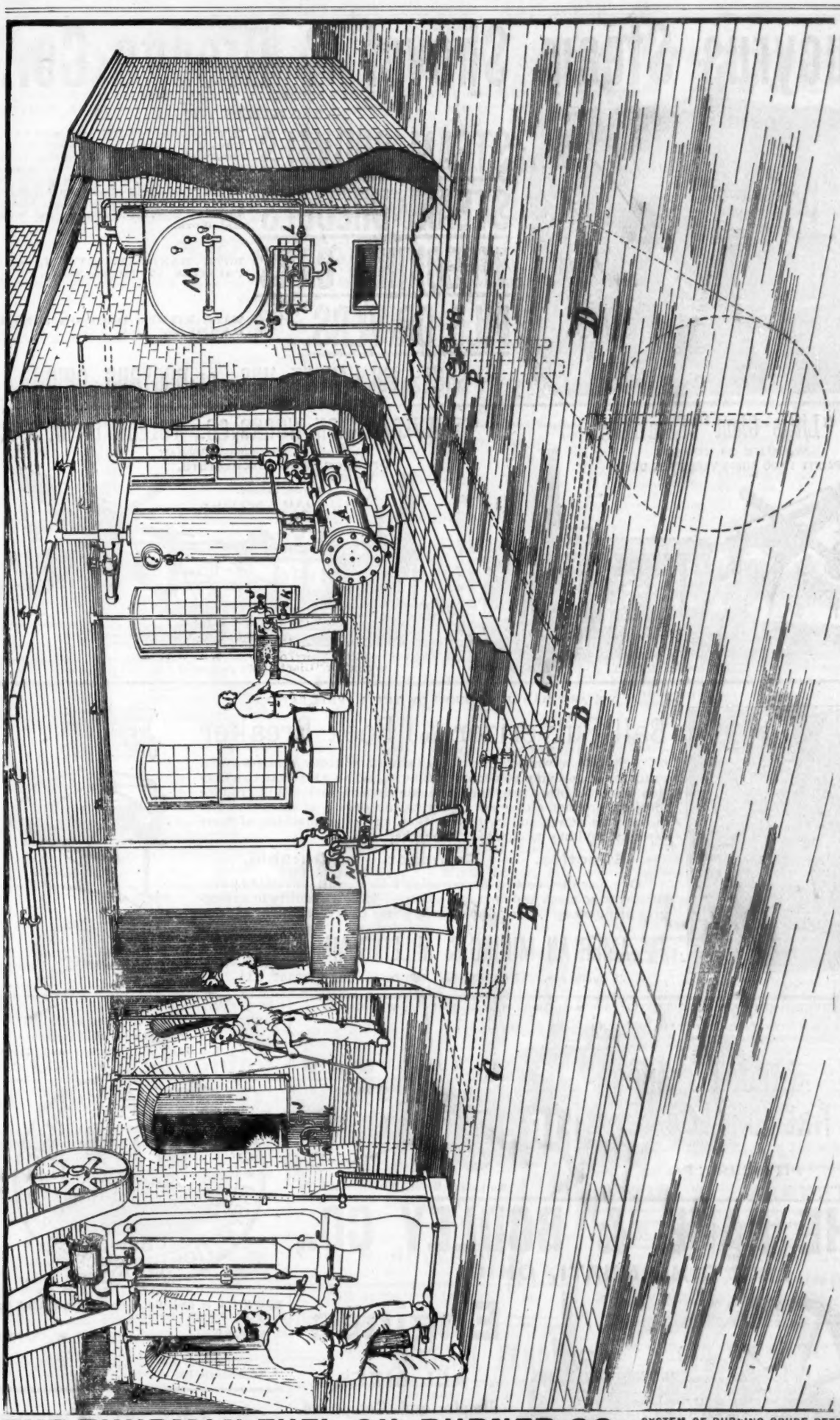
What we know and what we are able to do have been gained by hard and VERY HARD WORK, patient, intelligent and combined investigation and experimental work, and we ask those who are interested in what we are doing to consider that we have the only oil burner that makes pure hydro-carbon gas, and are the sole managers, and that for years to come we will be more likely to serve them than any UNSCRUPULOUS COPYIST could do, even if he had equal rights with us. We are already aware that some of our methods are being infringed by an unscrupulous concern who are trying to gain patronage by copying after us.



A is the air compresser. Through pipe B, the compressed air presses on the surface of the oil in tank D, forcing the oil through the pipe C, direct to the burners F, F, F, where it is met by the pressure of air from the same source of power. N, N, N, is the hot air pipe to furnace. The proportions of oil are regulated by the burner valves K, K, K, and the proportions of air are regulated by the valves J, J, J. The burners under the boiler M, can be operated by either air or steam. L, is the steam valve; P, is the inlet to tank, and R, is the vent. The air pressure thoroughly atomizes the oil, and oil atoms, and air atoms, intimately commingle with the hot air atoms from the furnace, and pass from the mouth of the burner in a highly combustible and vaporous form, with perfect combustion. The oil in our burners can be atomized by either air or steam pressure.

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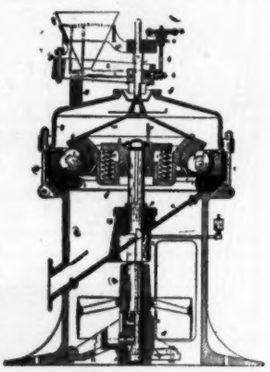

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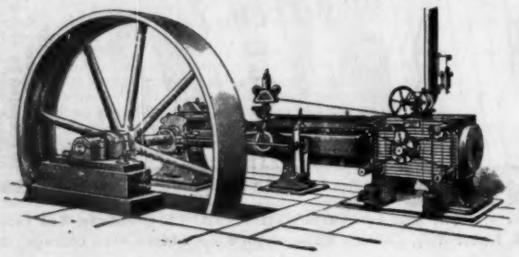

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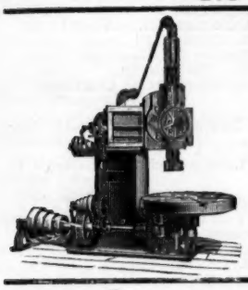

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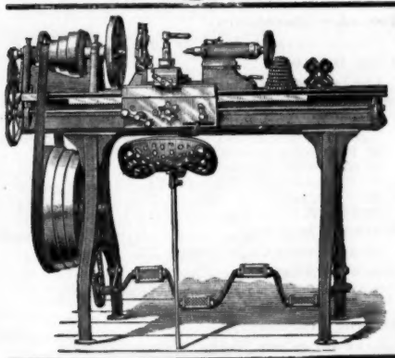

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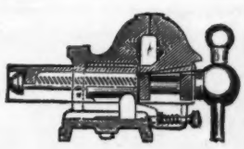

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W. F. & John Barnes Co., Rockford, Ill.
H. Bickford, Lakeport, N. Y.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.
The Billings & Spencer Co., Hartford, Conn.
Dawson & Goodwin, Chicago, Ill.
Cincinnati Milling Machine Co., Cincinnati, O.

Ladles—
Detroit Foundry Equipment Co., Detroit, Mich.

Land Companies—
Chicago Heights Land Association, Chicago, Ill.

Lathes—
Prentiss Tool & Supply Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
W. F. & John Barnes Co., Rockford, Ill.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.
Dawson & Goodwin, Chicago, Ill.

Laundry Machinery—
Chicago Laundry Machine Co., Chicago, Ill.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.

Machinists' Tools and Supplies—
Prentiss Tool & Supply Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O
W. F. & John Barnes Co., Rockford, Ill.
H. Bickford, Lakeport, N. Y.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.
Dawson & Goodwin, Chicago, Ill.

Machine Screws—
Illinois Screw Co., Chicago, Ill.

Machine Shops—
Toledo Machine & Tool Co., Toledo, O.
Harn, Ow & Co., Beaver Falls, Pa.

Mining Machinery—
Lake Shore Iron Works, Marquette, Mich.
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
Vulcan Iron Works Co., Toledo, O.
American Mining & Machinery Co., Cleveland.

Moulding Sand—
Garden City Sand Co., Chicago, Ill.

Municipal Bonds—
Frank R. Biedler, Baltimore, Md.

Milling Machines—
Prentiss Tool & Supply Co., Chicago, Ill.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.
Dawson & Goodwin, Chicago, Ill.
Cincinnati Milling Machine Co., Cincinnati, O.

Mines and Mining Stock—
Frank R. Biedler, Baltimore, Md.

Mining Engineers—
Richard A. Parker, Marquette, Mich.

Oil Tanks—
The J. C. McNeil Co., Akron, O.

Ore Crushers—
Lake Shore Iron Works, Marquette, Mich.
American Mining & Machinery Co., Cleveland.

Paint—
Iron Clad Paint Co., Cleveland.
Jos. Dixon Crucible Co., Jersey City, N. J.
Berger Bros., Philadelphia, Pa.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago.
Hendrick Mfg. Co., Ltd., Carbondale, Pa.

Planers—
Prentiss Tool & Supply Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.
Dawson & Goodwin, Chicago, Ill.

Plumbers' and Gas Fitters' Supplies—
Berger Bros., Philadelphia, Pa.

Portable Engines and Boilers—
Armstrong Bros., Springfield, O.

Portable Forges—
Foos Mfg. Co., Springfield, O.
Buffalo Forge Co., Buffalo, N. Y.
Cady Mfg. Co., Cleveland, O.

Portable Drills—
J. G. Timolat, 89 S. 5th ave., New York City.
Power Hammers—
W. H. Robertson, Chicago, Ill.
Presses—
Toledo Machine & Tool Co., Toledo, O.
Cleveland Stamping & Tool Co., Cleveland, O.
Cady Mfg. Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
Pulleys—
Lane & Bodley Co., Cincinnati, O.
J. H. & D. Lake Co., Massillon, O.
Pulverizing Machinery—
Lake Shore Iron Works, Marquette, Mich.
American Mining & Milling Machinery Co., Cleveland, O.
Pumps (Steam)—
E. H. Jones & Co., Cleveland.
Brightman Stoker Co., Cleveland, O.
Radial Drills—
Bickford Drill & Tool Co., Cincinnati, O.
Railroad Castings—
Vulcan Iron Works Co., Toledo, O.
Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland.
Garden City Sand Co., Chicago, Ill.
Rock Breakers—
Lake Shore Iron Works, Marquette, Mich.
American Mining & Machinery Co., Cleveland.
Rolling Mill Machinery—
The Lloyd-Booth Co., Youngstown, O.
Roofing (felt)—
Berger Bros., Philadelphia, Pa.
Consolidated Roofing Works, Columbus, O.
Rust Preventative—
Stevenson Bros. & Co., Philadelphia, Pa.
Sand and Chill Rolls—
The Lloyd-Booth Co., Youngstown, O.
Saws—
Peter Gerlach & Co., Cleveland.
Schools—
Correspondence School of Mechanics, Scranton, Pa.
Scrap Iron & Steel—
Klein & Cohn, Cincinnati, O.
Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Hendrick Mfg. Co., Ltd., Carbondale, Pa.
Screws—
Illinois Screw Co., Chicago, Ill.
Second-Hand Machinery—
Prentiss Tool & Supply Co., Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.
W. H. Robertson, Chicago, Ill.
Chicago Laundry Machine Co., Chicago, Ill.
Dawson & Goodwin, Chicago, Ill.
Shearing and Punching Machinery—
Bertsch & Co., Cambridge City, Ind.
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Cleveland Stamping & Tool Co., Cleveland, O.
Dawson & Goodwin, Chicago, Ill.
Sheet Iron—
Cleveland Rolling Mill Co., Cleveland.
Berger Bros., Philadelphia, Pa.
Smoke Consumer—
Brightman Stoker Co., Cleveland, O.
Smokeless Furnaces—
Brightman Stoker Co., Cleveland, O.
Special Machinery—
Toledo Machine & Tool Co., Toledo, O.
Cleveland Stamping & Tool Co., Cleveland, O.
Cady Mfg. Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
Stamping and Punching—
Cady Mfg. Co., Cleveland, O.
Stand Pipes—
The J. C. McNeil Co., Akron, O.
Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insuranc Co., Hartford, Conn.
Steam Shovels and Dredges—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
Vulcan Iron Works Co., Toledo, O.
Steel—
Wm. Jessop & Sons, Ltd. New York, N. Y.
Steel Castings—
Chester Steel Casting Co., Philadelphia, Pa.
Wm. Jessop & Sons, Ltd., New York, N. Y.
King & Andrew Co., Chicago, Ill.
Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.
Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland.
James Murdock, Jr., Cincinnati, O.
Stokers—
Brightman Stoker Co., Cleveland, O.
Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.
Tanks—
S. Freeman & Sons Mfg. Co., Racine, Wis.
R. Laird & Son, Galion, O.
Tinners' Hardware—
Berger Bros, Philadelphia, Pa.
Tinning Machinery—
The Lloyd-Booth Co., Youngstown, O.
Tool Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.
Tramways—
Trenton Iron Co., Trenton, N. J.
Trucks—
Detroit Foundry Equipment Co., Detroit, Mich.
Tumblers—
Detroit Foundry Equipment Co., Detroit, Mich.
Turret Drills—
A. P. Quint, Hartford, Conn.
Twist Drills—
Cleveland Twist Drill Co., Cleveland.
Valves—
Berger Bros., Philadelphia, Pa.
Valve Gears—
Geo. Marshall, Fremont, Neb.
Vises—
Capital Machine Tool Co., Auburn, N. Y.
Ventilating Fans—
E. H. Jones & Co., Cleveland.
Brightman Stoker Co., Cleveland, O.
Washers—
Milton Mfg. Co., Milton, Pa.
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Addyston Pipe & Steel Co., Cincinnati, O.
Radford Pipe & Foundry Co., Cincinnati O.
Well Drilling Machinery—
Williams Bros., Ithaca, N. Y.
Wheelbarrows—
Kilbourne & Jacobs Mfg. Co., Columbus, O.
Wire Fence Ratchets—
J. Stauffer, Dayton, O.
Wire Rope—
Trenton Iron Co., Trenton, N. J.
Wire Machinery—
John Adt & Son, New Haven, Conn.
Cady Mfg. Co., Cleveland, O.
Wood-Working Machinery—
J. A. Fay & Egan Co., Cincinnati, O.

The Advertiser who sticks to printer's ink in dull months will find trade sticking to him when the turn comes.

Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME
* Daily. † Daily, except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7.45 am	†11.55 am
Pittsburgh, Bellaire and East	†12.45 pm	† 6.25 pm
Philadelphia and New York	* 1.40 pm	*11.15 am
Baltimore and Washington	* 1.40 pm	*11.15 am
Alliance and Pittsburgh	* 1.40 pm	*11.15 am
Ravenna and Alliance	† 3.25 pm	† 9.50 am
Hudson and Ravenna	* 5 .0 pm	* 8.25 am
Philadelphia and New York	*11.10 pm	* 5.25 am
Baltimore and Washington	*11.10 pm	* 5.25 am
Alliance and Pittsburgh	*11.10 pm	* 5.25 am

Mt. Vernon and Pan-Handle Route.

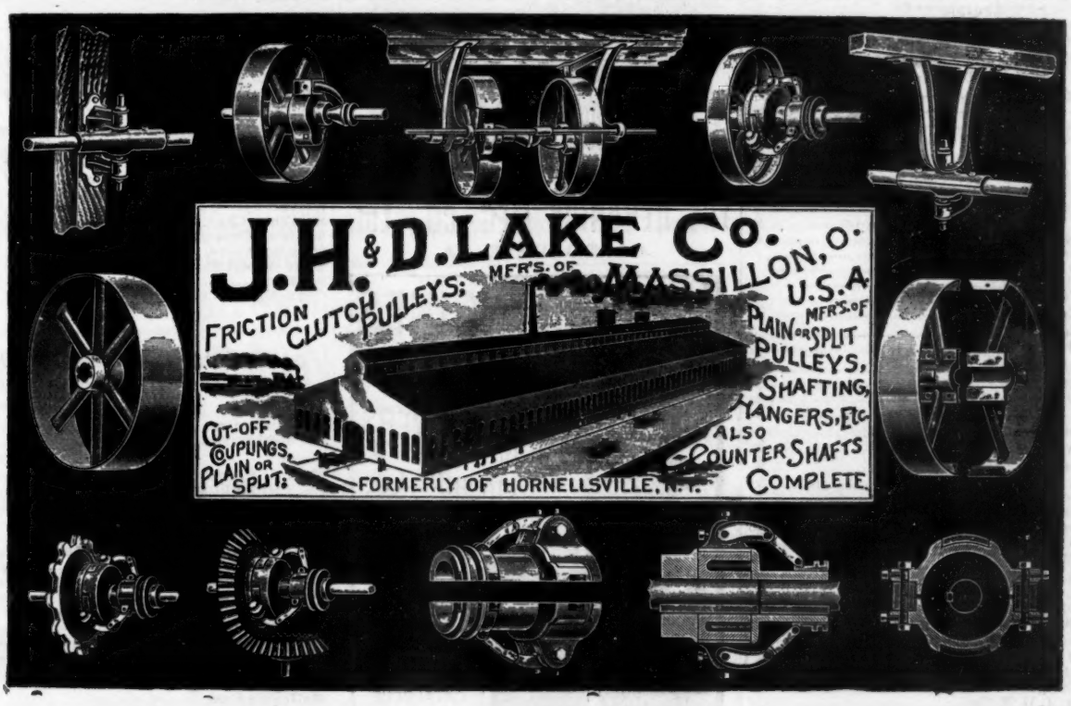
FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8.4c am	* 5.25 pm
Akron, Columbus & Zanesville	†12.45 am	*11.55 pm
Akron and Columbus	* 8.40 pm	*5.25 pm
Akron and Orrville	† 3.25 pm	† 9.50 am
Columbus and Cincinnati	* 8.00 pm	* 7.00 am

Valley Ry.

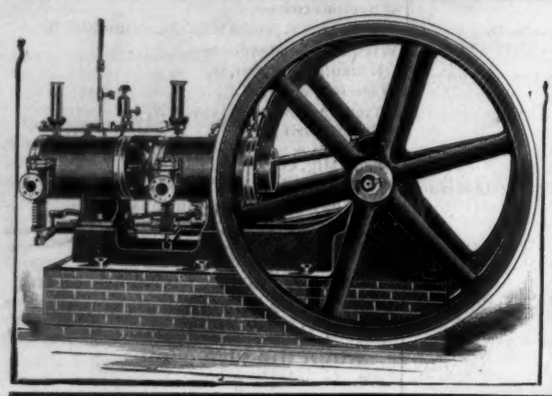
Depot foot of So. Water St.
City Office 143 Superior St.

	Arrive.	Depart.
Akron & Canton	*6:40 P M	*7:10 A M
Akron, Canton & Valley Jctn.	*10:10 A M	*3:15 P M
Valley Jctn. & Way Stations	†6:40 P M	†7:10 A M
Akron, Canton & Chicago	*8:00 A M	*6:30 P M
Wooster and Garrett	†3:00 P M	†11:00 A M
Wooster	.....	*6:30 P M
Akron, Canton & Marietta	†3:00 P M	†11:00 A M
Steubenville, Wheeling, Washington, D. C., and Baltimore	†3:00 P M	†11:00 A M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule Compartment Sleeping cars between Cleveland and Chicago.



HICKS GAS and GASOLINE ENGINES.



Latest and the best and the Gas and Gasoline Engine of the future. By its construction we get double the power from the same number of parts and weight as are used in the ordinary gas engines, thus enabling us to reduce the price to compete with steam engines, and as much better than the ordinary gas engine as the Corliss steam engine is better than the common slide valve of 20 years ago. Two to one hundred H. P. both vertical and Horizontal.

Write for Catalogue.

HICKS GAS ENGINE COMPANY,
CLEVELAND, OHIO.

Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

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Wells Engine Co.	31
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PERFORATED SHEET METALS

OF EVERY DESCRIPTION,
FOR SCREENING PURPOSES.

THE HENDRICK MFG. CO., Ltd.,
CARBONDALE, PA.

HOISTING ENGINES

MANUF'D BY
THE JOHN F. BYERS MACHINE CO.,
RAVENNA, OHIO.

WRITE FOR CATALOGUE.

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	3.00@ 3.35
No. 1 Bessemer hematite	2.75@ 0.00
Hematites No. 1 non-Bessemer	2.25@ 2.50
No 1. Specular, non-Bessemer	2.50@ 3.00

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$10 40@$10 60
No. 1 Strong Foundry	11 25@ 11 75
No. 2 Strong Foundry	10 25@ 10 75
No. 1 Gray Forge, red short	9 50@ 9 75
No. 2 Gray Forge, neutral	9 25@ 00 00
No. 1 American Scotch	11 60@ 00 00
No. 2 American Scotch	10 60@ 00 00
Lake Superior Charcoal	14 00@ 14 50

PITTSBURG:	
No. 1 Foundry	$11 25@$11 75
No. 2 Foundry	10 50@ 11 00
Grey Forge	9 25@ 9 50
White and Mottled	9 00@ 9 25
Warm Blast Charcoal	18 00@ 19 00
Cold Blast Charcoal	22 00@ 26 00
Bessemer	10 35@ 10 50

CHICAGO (reported by our representative:)	
Lake Superior Charcoal	$15 00@$15 50
Local Coke Foundry No. 1	11 25@ 11 50
Local Coke Foundry No. 2	10 50@ 11 00
Local Coke Foundry No. 3	10 00@ 10 50
Local Scotch Foundry No. 1	11 50@ 11 75
Local Scotch Foundry No. 2	10 75@ 11 25
Local Scotch Foundry No. 3	10 25@ 10 75
Southern Coke No. 1	10 75@ 11 00
Southern Coke No. 2	10 00@ 10 25
Southern Coke No. 3	9 75@ 10 00
Southern No. 1 Soft	10 00@ 10 25
Southern No. 2 Soft	9 75@ 10 00
Southern Silveries No. 1	11 50
Southern Silveries No. 2	11 00
Southern Gray Forge	9 35@ 9 60
Jackson Co. Silveries	14 60@ 15 00
Ohio Silveries No. 1	14 25@ 14 50
Ohio Silveries No. 2	11 75@ 12 00
Ohio Strong Softeners	12 60@ 12 85
Alabama Car Wheel	17 00@ 17 50
Southern Charcoal No. 1	13 75@ 14 00
Southern Charcoal No. 2	13 25@ 13 50

CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$10 50@$10 75
Southern Coke No. 2 and No. 1 Soft	9 50@ 9 75
Hanging Rock Coke, No 1	12 50@ 13 00
Hanging Rock Charcoal No. 1, Fdy	16 00@ 17 00
Tennessee Charcoal No 1	14 00@ 14 50
Jackson County Stone Coal No 1	14 50@ 16 00
Southern Coke, Grey Forge	8 75@ 9 00
" " Mottled	8 50@ 8 75
Standard Alabama Car Wheel	16 25@ 17 25
Tennessee " "	15 50@ 16 00
Lake Superior " "	16 00@ 16 50

BUFFALO (reported by Rogers, Brown & Co.)	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$11 75
No. 2 Foundry Strong Coke Iron Lake Superior Ore	11 25
Ohio Softener No. 1	11 75
Jackson Co. Silvery No. 2	15 50@ 17 00
Lake Superior Charcoal	14 75
Tennessee Charcoal	15 50
Southern Soft No. 1	11 20
Southern Soft No. 2	10 70
Alabama Car Wheel	16 00@ 17 50
Hanging Rock Charcoal	18 50

LOUISVILLE (reported by Geo. H. Hull & Co.)	
Southern Coke No. 1 Foundry	$10 25@$10 50
Southern Coke No. 2 Foundry	8 75@ 9 25
Southern Coke No. 3 Foundry	8 50@ 8 75
Grey Forge	8 00@ 8 50
Southern Charcoal No. 1 Foundry	12 50@ 13 50
Car Wheel	15 00@ 15 50
Spathite	11 25@ 11 75

ST. LOUIS (reported by Rogers, Brown & Meacham):	
Southern Coke No 1	$10 75@$11 00
Southern Coke No. 2	9 75@ 10 00
Southern Coke No. 3	9 50@ 9 75
Southern Grey Forge	9 00@ 9 25
Southern Charcoal No. 1	15 00@ 16 00
Missouri Charcoal No. 1	12 00@ 12 50
Ohio Softeners	14 50@ 15 00
Lake Superior	16 50@ 17 00
Southern	17 00@ 17 50
Connellsville Coke, St. Louis	4 50

OLD RAILS AND SCRAP METAL.

[Prices paid by mills.]

	GROSS TONS
Old iron rails	$12 50
Old steel rails	10 00
	NET TONS
No. 1 R. R. wrought scrap	$ 9 50
No. 1 wrought scrap	9 00
No. 1 Machine cast scrap	8 50
Iron axles	15 50
Axle turnings	8 00
Wrought turnings (free from cast)	6 75
Cast borings	5 00
Uncut wrought iron boilers	3 00
Steel boiler plates	8 00
Grate bars	4 00
Pipes and flues (clean)	7 00
Tank iron	6 75
Hoop and band iron	5 00
Sheet iron	5 00
Wrought drillings	6 50
Malleable iron	7 50

Frank P. Cady, Pres. and Supt.
Geo. H. Bowler, Sec'y and Treas.

THE CADY MFG. CO.

283 W. River St., CLEVELAND, O.

WIRE FORMING MACHINES.

Power Presses, Dies, Drop Hammers, Punches and Shears, Special Machinery, Wire Cutters and Straighteners.

J. A. FAY & CO.

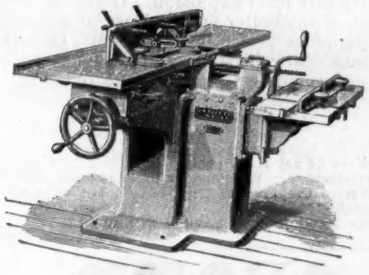
286 to 306 W. Front St.,
CINCINNATI, OHIO,
U. S. A.

WOOD-CUTTING MACHINERY
FOR ANY PURPOSE.

MAKERS, INTRODUCERS AND ORIGINATORS.

PATTERN AND FLASK MAKING MACHINERY, ETC., SUPPLIED.

The latest and most advanced ideas for fast, perfect and reliable productions.



NO. 2 VARIETY WOOD-WORKER.

The infinite variety of work performed by this machine has given it the position as the most useful one in existence for the working of wood. It is simply invaluable, for it is capable of almost every operation known to the art.

THE LONG LINE OF AWARDS, FROM 1851 DOWN TO THE "GRAND PRIX" AT PARIS, 1889, HAS BEEN ADDED TO BY THE CAPTURE OF THE "GRAND HONORS" AT THE WORLD'S FAIR, CHICAGO, 1893.

PERFORATED METALS

OF ALL KINDS FOR
MILLING MINING AND
AGRICULTURAL MACHINERY,

PERFORATED IRON, STEEL, COPPER, BRASS, TIN, ZINC, LEAD, ETC., TO ORDER.
LARGE AND VARIED ASSORTMENT OF SIZES. CORRESPONDENCE SOLICITED.

THE ROBERT AITCHISON. PERFORATED METAL CO.,

OFFICE, ROOM 510 265 TO 269 DEARBORN STREET, CHICAGO, ILL. WORKS SOUTH CHICAGO.

Horse AND Mule Shoes

SHEETS, BARS, SLABS AND BILLETS.
Light Sheets for TINNING AND PERFORATING a Specialty.
Geo. H. Sibell & Co., 614-218 La Salle St., Chicago.

PL

DIXON'S PERFECT LUBRICATING GRAPHITE.

The most Marvelous Lubricant Known.
Used Dry, or Mixed with Water, Oil or Grease

NOT AFFECTED BY HEAT, COLD, STEAM OR ACIDS.

An Interesting and Instructive Pamphlet will be sent Free of Charge.

JOS. DIXON CRUCIBLE CO. Jersey City, N. J.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g,
CLEVELAND, OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE
Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. mill)	1.20C@1.30C
Angles	1.25C@1.35C
Tees	1.35C@1.45C
Universal Plates	1.25C
Sheared Plates	1.35C

MERCHANT IRON AND STEEL.

[List prices out of store.]

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 30
4¼ to 6 by ⅜ to 1 inch	1 35
1¾ to 6 by 1½ to 2 inch	1 50
1¾ & 1¾ by ⅜ to ¾ inch	1 35
1 & 1¼ by ⅜ to ¾ inch	1 40
⅝, ¾, ⅞, by ⅜ to ⅝ inch	1 50

Round and Square.

1 to 1⅞ inch	1 30
2 to 2⅝ inch	1 40
2¾ to 3¼ inch	1 55
3⅜ to 4 inch	1 80
4¼ to 4½ inch	2 40
4¾ to 5 inch	2 60

Oval.

⅜ to 1¼ inch	1 50
⅜ to ¾ inch	1 50
½	1 70
¾	1 90

Half Oval and Half Round.

1½ to 3 inch	1 85
⅞ to 1½ inch	1 65
⅜ to ¾ inch	1 90
½	2 05
⅜	3 15

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	1 40
1 to 1¾ by ¼ and 5-16 inch	1 45
¾ to ⅞ by ¼ and 5-16 inch	1 55
½ to ⅝ by ¼ and 5-16 inch	1 80

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	1 85
1 7-16 to 2, No. 17, 18 and 19	1 90
1 7-16 to 2, No. 20	2 00
1 7-16 to 2, No. 21	2 10
1 7-16 to 2, No. 22	2 20
1¼ to 1⅜, No. 13, 14 and 15	1 90
1¼ to 1⅜, No. 16, 17 and 18	1 95
1¼ to 1⅜, No 19 and 20	2 00
1¼ to1⅜, No. 21	2 10
1¼ to 1⅜, No. 22	2 20
15-16 and 1 inch, No. 13, 14 and 15	1 85
15-16 and 1 inch, No. 16, 17 and 18	2 00
15-16 and 1 inch, No. 19 and 20	2 10
15-16 and 1 inch, No. 21	2 20
15-16 and 1 inch, No. 22	2 30
⅞, No. 13, 14 and 15	2 10
⅞, No. 16. 17 and 18	2 20
⅞, No. 19 and 20	2 30
⅞, No. 21	2 40
⅞, No. 22	2 50
13-16, No. 13, 14 and 15	2 20
13-16, No. 16, 17 and 18	2 30
13-16, No. 19 and 20	2 40
13-16. No. 21	2 50
13-16, No. 22	2 60
¾, No. 13, 14 and 15	2 30
¾, No. 16, 17 and 18	2 45
¾, No. 19 and 20	2 55
¾, No. 21	2 65
¾, No. 22	2 75
11-16, No. 13, 14 and 15	2 55
11-16, No. 16, 17 and 18	2 60
11-16, No. 19 and 20	2 70
11-16, No. 21	2 80
11-16, No. 22	2 90
11-16, No. 23	3 00
⅝, No. 13, 14 and 15	2 60
⅝, No. 16, 17 and 18	2 70
⅝, No. 19 and 20	2 80
⅝, No. 21	2 90
⅝, No. 22	3 00
⅝, No. 23	3 10
9-16, No. 13, 14 and 15	2 80
9-16, No. 16, 17 and 18	2 90
9-16, No. and 20	3 00
9-16, No. 21	3 10
9-16, No. 22	3 20
9-16. No. 23	3 30
7-16 and ½ inch, No. 13, 14 and 15	3 00
7-16 and ½ inch, No. 16, 17 and 18	3 10
7-16 and ½ inch, No. 19 and 20	3 20
7-16 and ½ inch, No. 21	3 30
7-16 and ½ inch, No. 22	3 40
7-16 and ½ inch, No. 23	3 50
⅝, No. 13, 14 and 15	3 50
⅝, No. 16, 17 and 18	3 60
⅝, No. 19 and 20	3 70
⅝, No. 21	4 00
⅝, No. 22	4 10
⅝, No. 23	4 25

Light Band.

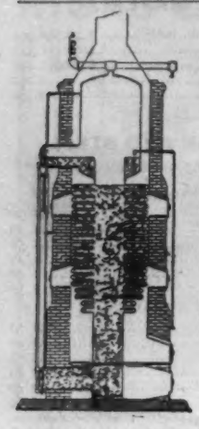
1¼ to 6 by ⅛ to 3-16 inch	1 60
1¼ to 6 by Nos. 11 and 12	1 65
1 to 1¾ by ⅛ to 3-16 inch	1 65
1 to 1¾ by Nos. 11 and 12	1 70
⅞ and 13-16 by ⅛ to 3-16 inch	1 80
⅞ and 13-16 by Nos. 11 and 12	1 85
¾ and 11-16 by ⅛ to 3-16 inch	1 90
¾ and 11-16 by Nos. 11 and 12	1 95
⅝ and 9-16 by ⅛ to 3-16 inch	2 05
⅝ and 9-16 by Nos. 11 and 12	2 10
½ by ⅛ to 3-16 inch	2 20
½ by Nos. 11 and 12	2 25

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	1 80
⅞ inch, " " " " 13 and 14	1 90
¾ inch, " " " " 11 and 12	1 95
¾ inch, " " " " 13 and 14	2 15

Sheet Iron.

No. 10	1 85
No. 12	1 90
No. 14	1 95



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WATER TUBE BOILER.

This Boiler is absolutely safe from explosion. Gives as much steam from the waste heat as any boiler made. Easy of access for cleaning and repairs. Furnishes perfectly dry steam. Occupies little ground space. Economical in first cost. Send for complete circulars giving list of users and testimonials, one of which is printed below.

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Niles, O., Aug. 18, 1893. }

Chas. P. Adams, Esq.

Dear Sir: The three boilers of 225 H. P. each which you furnished us are working in every way satisfactory. We consider them as good steamers as any we have ever used. Up to the present time have spent nothing on them for repairs. Very respectfully,

The Falcon Tin Plate & Sheet Co.,
By Warner Arms, Pres't.

C. P. ADAMS.

807 The Cuyahoga, - CLEVELAND. O.

Moffet Portable Drill

UNSURPASSED AS A REAMER.

Weighs 48 pounds and drills from 3/8 to 2 inches diameter.

Runs with Steam or Compressed air.
Will Work in Any Position.
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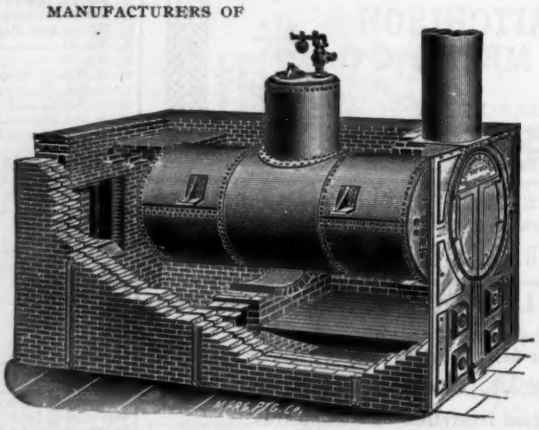
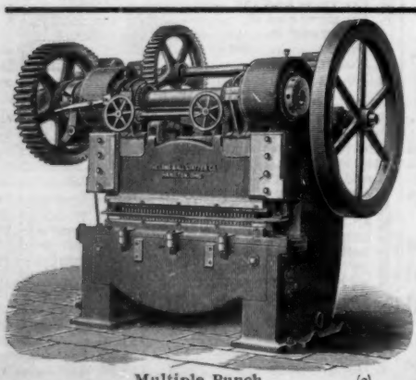
Smokestacks, etc., - - - - Grey Iron Castings.

Write for Prices and Terms.





Multiple Punch. (2)

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Power Punches and Shears,

for all kinds of Boiler, Tank and Structural Iron Work, Rolling Mills, Locomotive Shops, Car and Wagon Shops, Plow Shops, etc. Send for catalogue.

Subscribe for the Iron Trade Review, $3 per year.

No. 15-17	2 05
No. 18	2 20
No. 20	2 30
No. 22-24	2 40
No. 25.26	2 50
No. 27	2 60

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 60
Shell	1 85
Flange	2 10
Marine Flange	2 35
Fire Box	3 35

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c. ℔. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	08
9-16 to ½ in. "	08½
7-16 to ⅜ and 2¾ to 3 in.	09
3¼ to 4 in.	09½
⅜ to 11-16 and 4¼	10
⅝ to 6 in.	10½
¼ to 9-32 and 6⅛ to 7 in.	11
3-16 in	13

Flats.

	cts. lbs.
2 to 9-16 in. wide by 2 to 5/8 thick	8

Bessemer and O. H. Steel.

Machinery	base price,	1 80
Tire	"	1 85
Spring	"	2 20
Sleigh Shoe	"	2 20
Toe Calk	"	2 05
Cutter Shoes, tapered and bent	"	2 45

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 70
Bridge ½, ⅝, 11-16 and ¾ inch diam	3 40

MACHINERY SUPPLY MARKET.

Anvils.

American	℔ lb 9@10
Wright's	℔ lb 12

Bellows.

Blacksmiths' { Hill's	dis 40
Blacksmiths' { Bullock's	dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single,	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&5
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis 45

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.,	dis 35
Buffalo	dis 40

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 35
Horton's Universal	dis 40
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 20

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

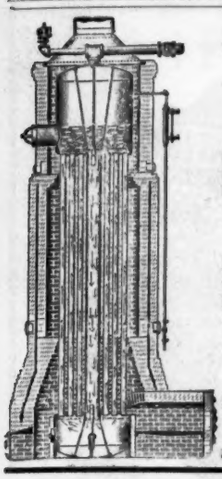
Cast Steel	℔ 3½
Iron, steel points	℔ lb 3

Drill and Drill Sockets.

Twist Drills	dis 50&10
Morse Taper and Straight Shank to 1½"	dis 50&10
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 55@55&5
Cleveland " "	dis 55@55&5

Emery.

	No. 4 to No. 46 gr.	No. 54 to No. 150 gr.	Flour, C. F. F, FF.
Kegs, ℔ lb	4½c	5 c	2½c
½ kegs ℔ lb	4¾c	5¼c	2¾c
¼ kegs ℔ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans less than 10	10 c	10 c	7½c



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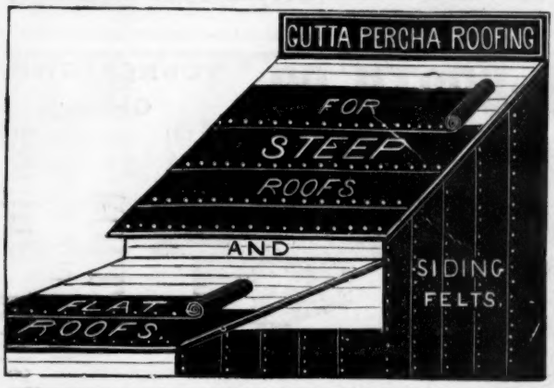

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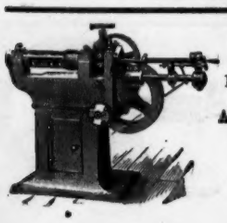

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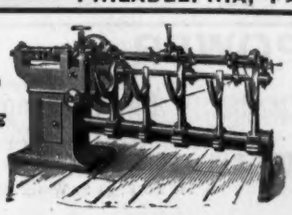
Builders of Machinery for Hardware Manufacture.

Automatic Wire Straightening and Cutting Machines, Butt Milling Machinery, Butt Drilling Machinery, Riveting Machines, Foot Presses, Spruc Cutters, Etc.



Emery Cloth and Paper.

Barder, Adamson & Co.	dis 50@50&5
H. H. Barton	dis 50@50&5

Emery Wheels.

Detroit	dis 55@60
Norton's	dis 55@60
Grant	dis 55@60
Sterling	dis 60
Celluloid	dis 10&33⅓
Northampton	dis 55
Crystal	dis 65@70
Vitrified	dis 60
Vulcanite	dis 60&10
Hamden	dis 60&10@70
Cyclone	dis 60@60&10

Files.

Arcade	dis 60&10@60&10&10
Nicholson	dis 60&10@60&10&10
" X. F	dis 25
Kearney & Foot	dis 60&10@60&10&10
Black Diamond	dis 60&10@60&10&10
McClellan	dis 60&10@60&10&10
Disston's	dis 65@70
Western	dis 70
Stub's	dis 25
Grobet's	dis 30
Reynolds Bros.' Hand Cut	dis 50
Industry File Works Hand Cut	dis 50

Hammers.

P. S. W	dis 40
Atha new list, Jan. 15, 1887	dis 50
Heavy hammers and sledges under 5 lbs	15c
" " " " over 5 lbs	12c

Jack Screws.

Illinois Bolt Co. list	dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3¾	3½
Hexagon	15½	11½	8½	6	5¾	5¼	
Washers	9	8	7	5	4½	4⅛	4⅛

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887	dis 85
Standard Penny Nails, ₩ keg card rate	
Car lots	$1.20
Less than car lots	$1.35

Oilers.

Zinc and Tin	dis 60
Brass and Copper	dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz	dis 10@10&10

Packing, Steam.

Boston Belting Co.	dis 60
American Packing Hemp	₩ lb 9@10
Russia " "	₩ lb 14
Italian " "	₩ lb 13@19
Plumbago Piston	₩ lb 40
Peerless	₩ lb 60
Morrison's "	₩ lb 45
Square Flax "	₩ lb 50
Sheet Rubber	₩ lb 12&24
Excelsior Rubber	₩ lb 48
Rainbow	Full Rolls 45c ₩ lb; Less than Full Rolls 50c ₩ lb
Eclipse Gasket	₩ lb 75

Picks.

Railroads, 5 to 6 lbs	$12 dis 60
" 6 to 7 lbs	$13 dis 60

Pulleys.

Iron Pulleys, Walker List	dis 50
Medart Pulleys	dis 50
Split Wood Pulleys	dis 55@60

Rivets.

Iron, Thousand, list November 17	dis 50&10@60
Iron, Ordinary, Cooper's Block and Carriage list November 17	dis 50&10@60
Copper	dis 50@50&10

Saws.

Disston's Circular	dis 40&10
" Band	dis 25
" Scroll	Net
Hack Saw Stubs	dis 20
" " Eureka	dis 20
" " Star	dis 20
Saw Swages Diston's	dis 30
Atkins' Circular Saws	dis 40&45
" Mill, Mulay and Drag Saws	dis 40&10
" Wood Saws	dis 40&10
" Silver Steel Diamond Cross-cut Saws	70c per ft
" Dexter Cross-cuts	50c "
" Diamond "	30c "
" Tuttle Tooth Cross-cuts	25c "
" One-man Cross-cuts	32c "
No. 1 Handles	23c per pair
No. 6 "	16c "
Excelsior Saw Tools	$6 per doz
Derfection "	$15 "
Petroit Saw Works, Circular	dis 50
" " " Band	dis 25
" " " Mulay	dis 45

Taps.

Cards, Hand and Nut to 2 in	dis 50
Carpenters' " " "	dis 50
Morse " " "	dis 50
Pratt & Whitney " " new list	dis 10
Machine Screw Taps	dis 55
Pipe Taps to 2½ in	dis 70
Stay Bolt Taps	dis 25
Stove Bolt Taps	dis 55
Pulley Taps	dis 40

Vises.

Solid Box	dis 60
Parker's	dis 20@25
Prentiss	dis 20
Stephen's	dis 25@30
Barrett's	dis 30
Miller's Falls	dis 40
Merrill's	dis 15@20
Howard	dis 35

Wire.

New List, Jan. 18, 1884

Brass	dis 30
Copper	dis 40
Bright and annealed, Nos. 0@18	dis 70&10@75
" " Nos. 19@26	dis 75@75& 5
" " Nos. 27@36	dis 75&10& 5
Coppered Nos. 0 to 18, market list	dis 70@70& 5
Galvanized Nos. 0 to 18 " "	dis65& 5
Tinned market Nos. 0 to 18	dis 67½
Cast steel	dis 50
Tinned Broom Wire	dis 70&5@70&10
Annealed Fence, Nos. 8 and 9	dis 75
Annealed Grape, Nos. 10 to 14	dis 75
Stub's Steel Wire regular	95c ₩ ℔ dis 30

Wrenches.

Coe's genuine	dis 50
Girard Standard	dis 70&10
Agricultural	dis 75&10
Mechanic's	dis 55&10& 5
Bemis & Call's Combination	dis 35
Donohue's Engineers	dis 20&10
Lamson & Sessions Engineers	dis 60
Billings & Spencer's Drop Forged	dis 25
William's " "	dis 25
Alligator " "	dis 40

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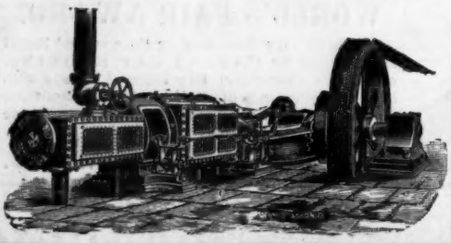

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From 1 to 100 horse-power. } **Can be Used in City or Country.**

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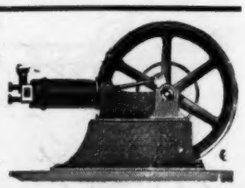

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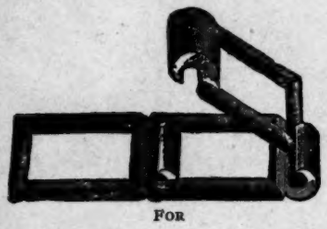

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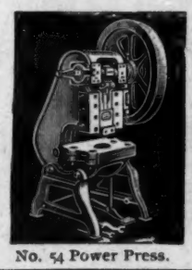

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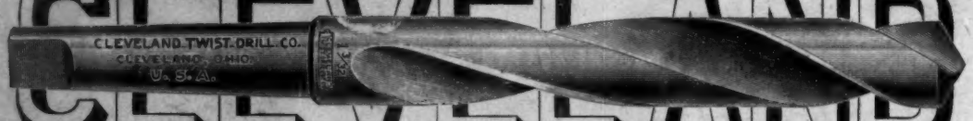

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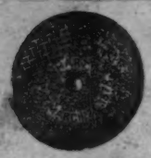

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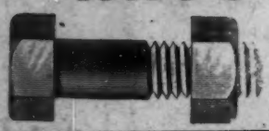

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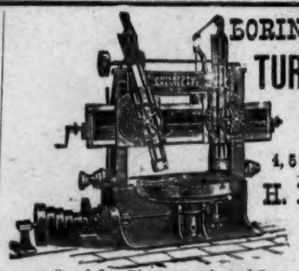

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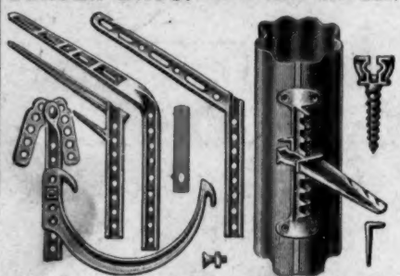

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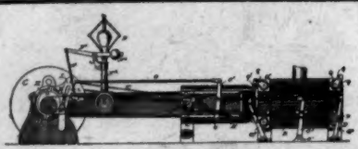

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